

JULY 1, 1915

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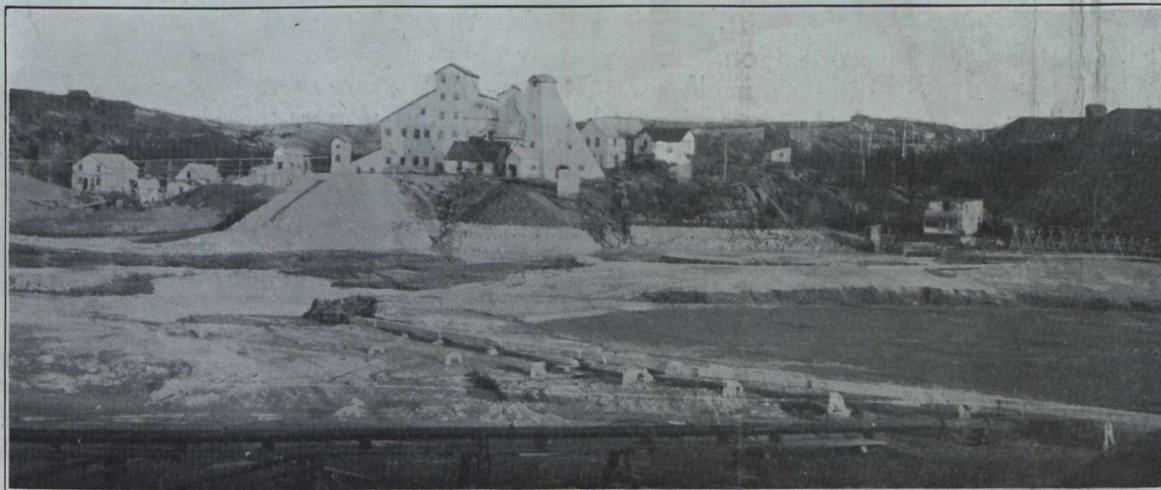
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# ⚡ CANADIAN ⚡ MINING JOURNAL

VOL. XXXVI

TORONTO

No. 13



A VIEW ACROSS THE RECENTLY EXPOSED BED OF COBALT LAKE

Elbert Hubbard's philosophy of advertising was positive and clearly crystallized.

"Advertising," he once wrote, is simply announcing to the world in an effective way where you are, who you are and what you have to offer in the way of human service or commodity. All live men are advertisers, and the only man who should not advertise is the man who has nothing to offer the world in the way of human service, and such a man is a dead one, whether he knows it or not.

"Advertising is a legitimate and ethical proposition. Life is too short for you to hide yourself away, mantled in your own modesty, and let the world hunt you out. Even the dead are advertisers, for on visiting a beautiful cemetery I noticed that on nearly every marble slab was given a list of the virtues, talents and beautiful qualities which the dead man was supposed to have carried in stock. This is what you call non-productive advertising from an emotional standpoint.

"Personally, I do not endorse it. Advertise while you are alive and send flowers to the man when he can appreciate them."

# Have You Read Bulletin 4033 ?



If possible, we would place a copy of our "LITTLE TUGGER" HOIST bulletin in the hands of every mining man in Canada. We are certain that it is the most interesting booklet yet produced on the subject of hoisting, and that it will pay you to read it.

Send your address.

Operates by steam or by air.

**Canadian Ingersoll-Rand Co., Limited**

**Montreal - Canada**

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CONTRACTORS TO ADMIRALTY WAR OFFICE AND COLONIAL GOVERNMENTS

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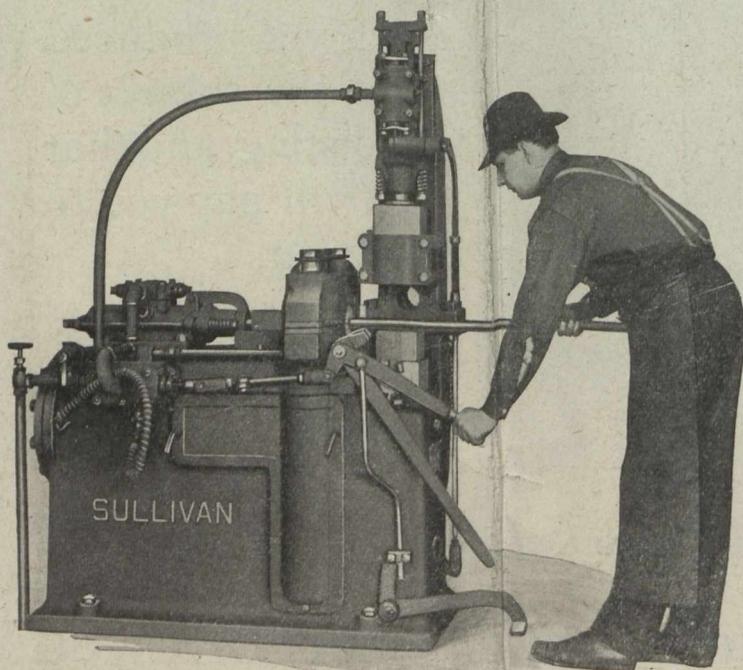
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### And Preserve the Quality of Your Steel

Hammer-forged bits retain all the toughness and strength you paid for in selecting a good grade of steel. They possess added refinement of grain and resistance to wear, due to the hammering process.

### THE SULLIVAN SHARPENER

is an "all-hammer" machine. This picture shows it putting the spread or flare on the steel by upsetting it with rapid blows of a horizontal hammer. The steel is gripped in dies, by a powerful compressed air vise.

The wings and corners of the bit are hammered out under vertical swaging dies.

Sullivan Sharpened Bits cut faster and farther.

Bulletin 672.

Sullivan Machinery Company,

122 South Michigan Avenue  
CHICAGO

# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H.P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

**HON. E. H. ARMSTRONG,  
Commissioner of Public Works and Mines,  
HALIFAX, N. S.**



## PROVINCE OF QUEBEC

Department of Colonization, Mines and Fisheries

*The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.*

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

**MINERS' CERTIFICATES.** First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is \$10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

**WORKING CONDITIONS.** During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

**SIX MONTHS AFTER STAKING.** At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

**MINING LICENSE.** The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of \$10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

**MINING CONCESSION.** Notwithstanding the above, a mining concession may be acquired at any time at the rate of \$5 an acre for SUPERIOR METALS, and \$3 an acre for INFERIOR MINERALS.

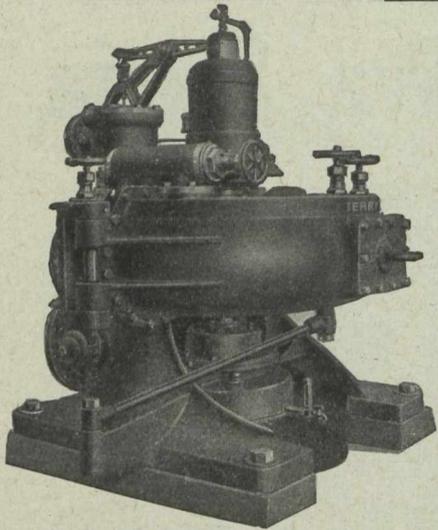
The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

**PROVINCIAL LABORATORY.** Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

**THE HONOURABLE THE MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC**

*When Answering Advertisements please mention THE CANADIAN MINING JOURNAL.*



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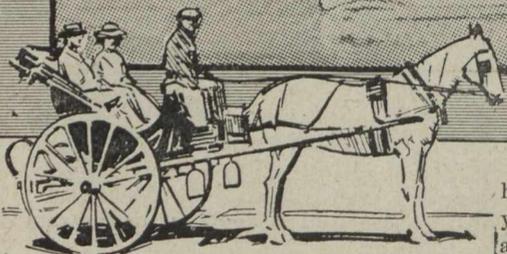
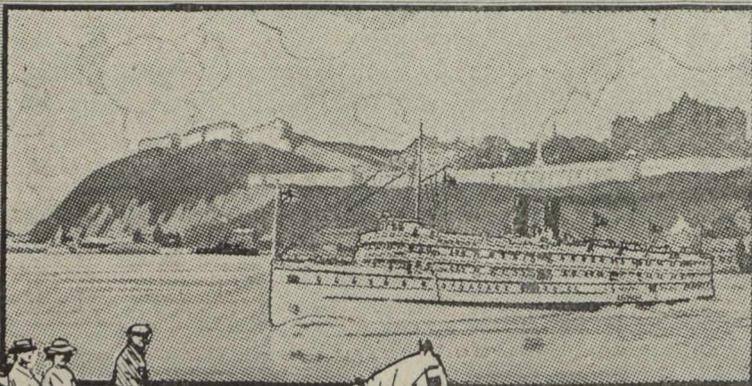
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holiday quite as fascinating as any you ever had abroad. Our book tells all you’ll want to know—tells all about our famous Niagara-to-the-Sea trip, and about our delightful Summer Hotels at Murray Bay and Tadousac. Send 6c. in stamps to cover cost of mailing.

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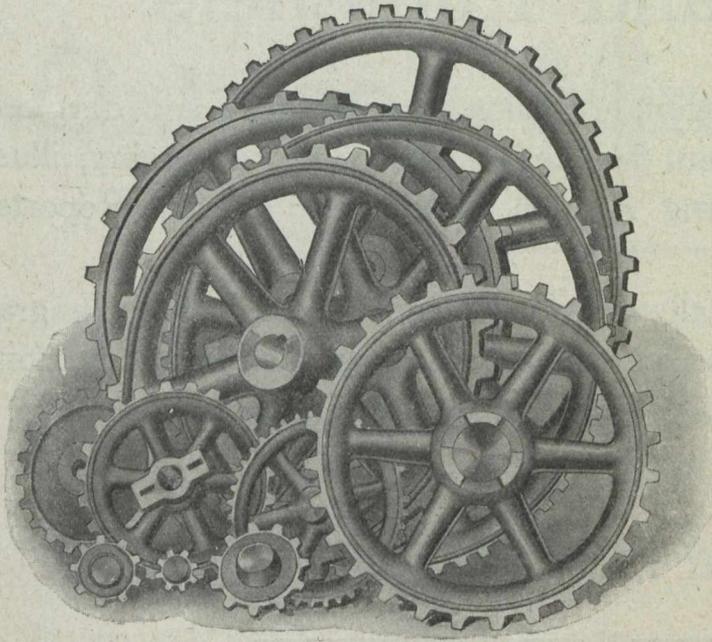
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## Synopsis of Coal Mining Regulations

**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal sub-divisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

W. W. CORY, Deputy Minister of the Interior.

N.B. — Unauthorized publication of this advertisement will not be paid for.—58782.

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We wish to draw the attention of mining, metallurgical, and development corporations to our excellent facilities for compiling, arranging, illustrating, printing and distributing Annual Statements, Special Reports, Descriptive Pamphlets, etc.

We guarantee our work in all respects. In letter-press, half-tone engravings and reproductions in colour, we are prepared to give entire satisfaction.

We shall be glad to furnish estimates to enquirers.

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OR

**Canadian Mining Journal,** 263-5 ADELAIDE ST. WEST,  
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Camp and Kitchen Supplies, Gen-  
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Shafting, Pulleys, Gearing, Hangers,  
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Brass and Iron Castings of every de-  
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A state institution offering engineering courses leading to the degree of Engineer of Mines. Located in the Lake Superior mining district. Mines and mills accessible for college work. For Year Book and booklet of views, address President or Secretary.

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# Ontario's Mining Lands

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There are many millions of acres in Eastern, Northern, and Northwestern Ontario where the geological formations are favorable for the occurrence of minerals, the pre-Cambrian series being pre-eminently the metal-bearing rocks of America.

The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Helen, Magpie, and Moose Mountain.

Many other varieties of useful minerals are found in Ontario:—cobalt, arsenic, iron pyrites, mica, graphite, corundum, talc, gypsum, salt, petroleum, and natural gas.

Building materials, such as brick, lime, stone, cement, sand and gravel, are abundant.

The output of the mines and metallurgical works of Ontario for the year 1913 was valued at \$53,232,311. Ontario has the largest mineral production of any of the Provinces.

The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water.

A miner's license costs \$5.00 per annum, and entitles the holder to stake out three claims a year in every mining division.

For maps, reports of the Bureau of Mines, and mining laws, apply to

**HON. G. H. FERGUSON,**

Minister of Lands, Forests and Mines,

**Toronto, Canada.**

## Dominion Coal Company

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Glance Bay

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19 Collieries

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Screened, run of mine and slack

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Collieries at Glance Bay, C.B., and Springhill, N.S.

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112 St. James Street, Montreal

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For Calendar of the School and further information apply to The Secretary, School of Mining, Kingston, Ontario.

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## ELECTROLYTIC NICKEL 99.80%

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Send inquiries direct to us



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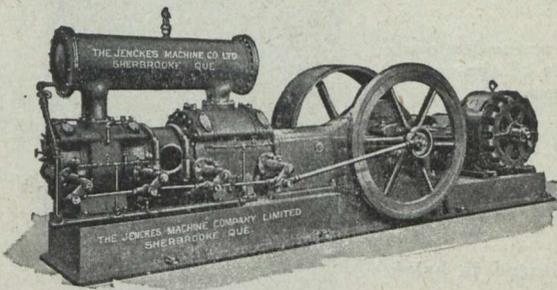
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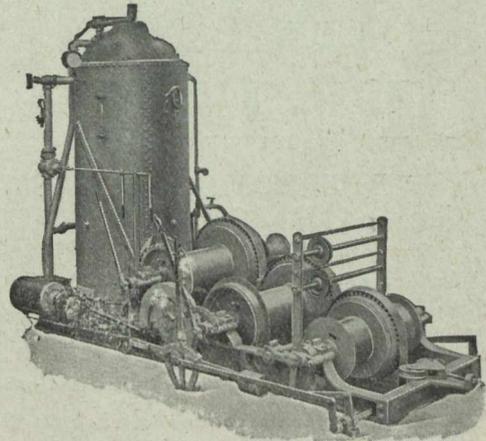
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By EDMOND NORTON SKINNER, Ph. B., E. M.  
and H. ROBINSON PLATE, Mining Engineer.

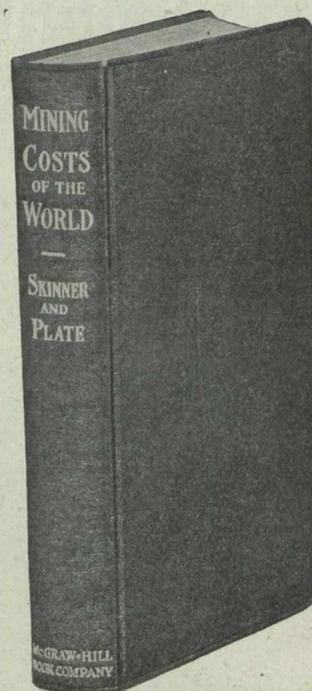
An Engineer's and an Operator's Pocket Book giving the production costs and operating data of about 325 of the principal metal mines of the world. It is the first book to cover the field in such an extensive manner.

It contains a thorough compilation of operating results taken from the annual reports of mining companies and other reliable sources.

It is an invaluable reference work for Engineers, Managers, Superintendents, Operators and Students; affording as it does, cost data on the principal mining districts of the world.

The data cover a period of two to four years and are arranged in brief, convenient form.

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**THE CANADIAN MINING JOURNAL**  
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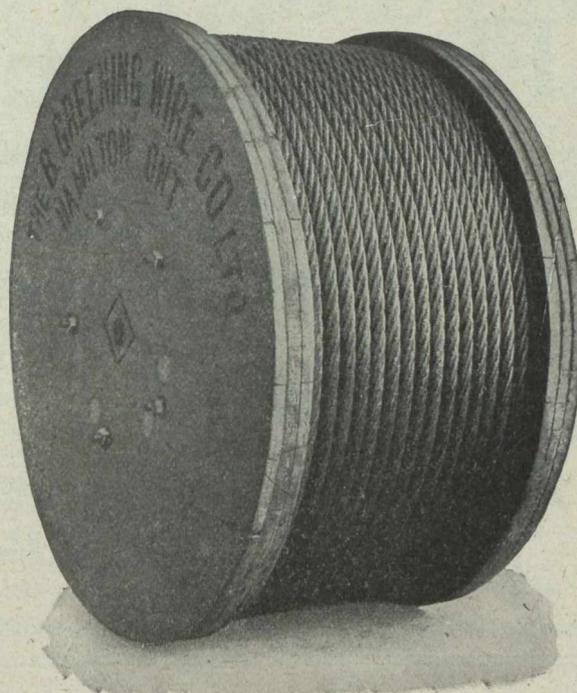
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**ALUMINOID** Specially pre-  
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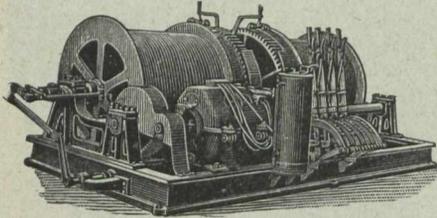
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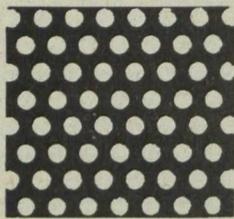
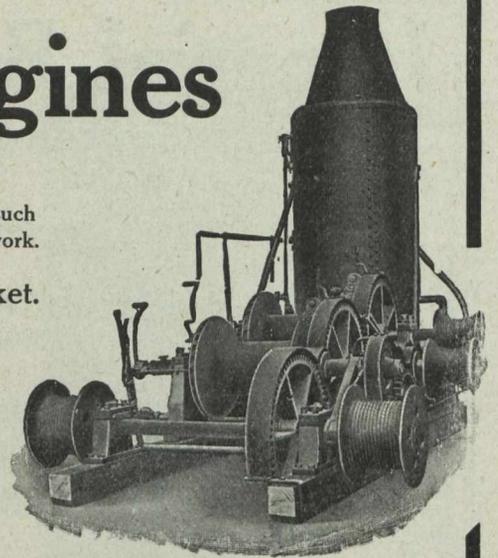
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For Every and All Purposes in all Metals

Elevator Buckets (plain and perforated).  
Conveyor Flights and Trough, also  
General Sheet Iron Work.

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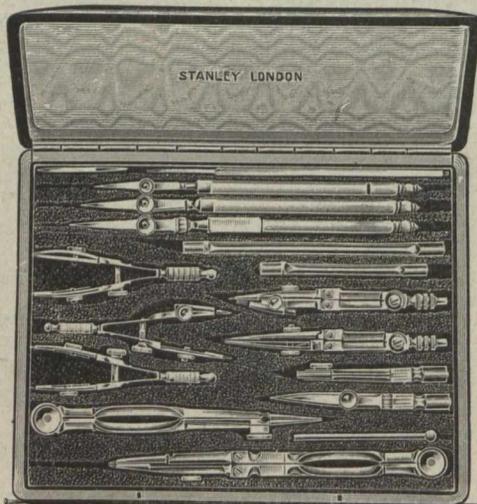
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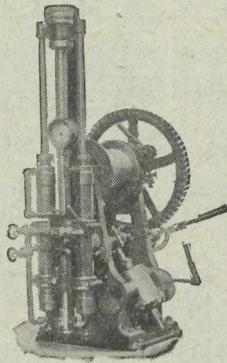
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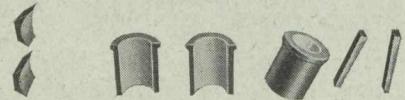
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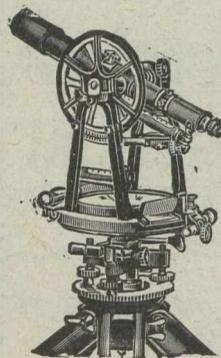
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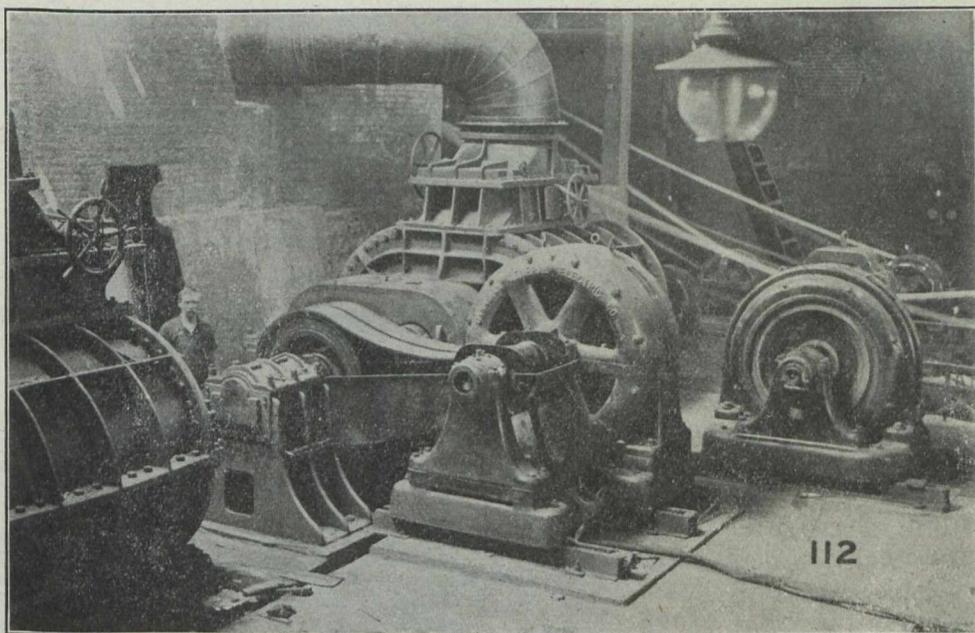
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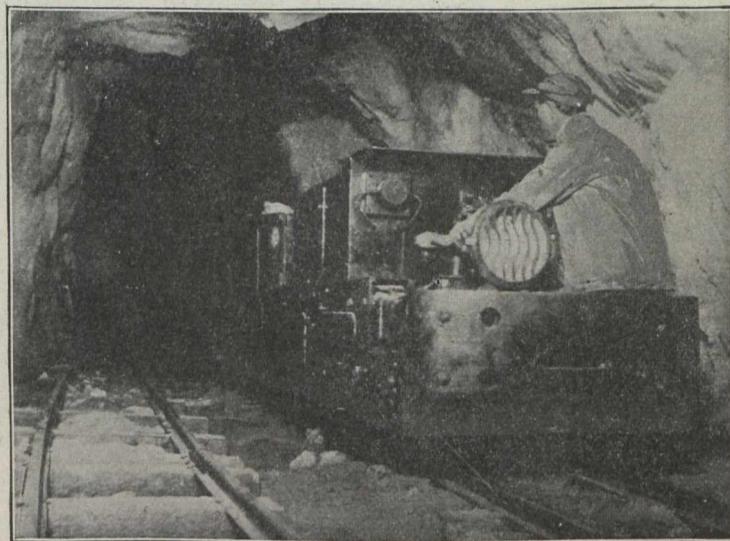
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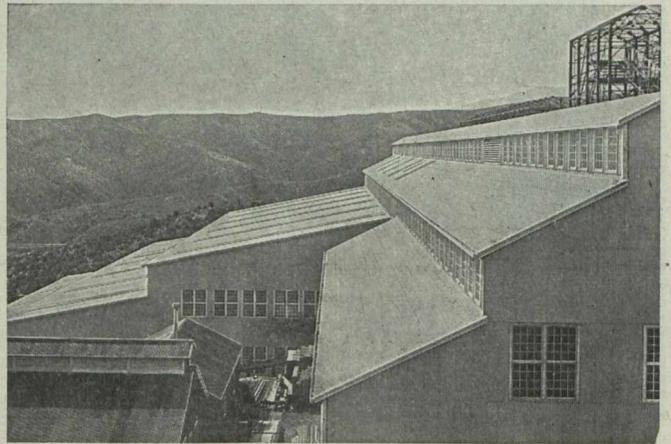
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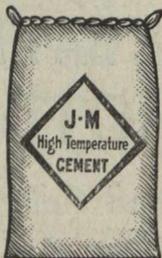
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# THE CANADIAN MINING JOURNAL

VOL. XXXVI.

TORONTO, July 1, 1915.

No. 13

## The Canadian Mining Journal

With which is incorporated the

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REGINALD E. HORE

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### CIRCULATION

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd, 1879."

Editorials—	Page.
Treatment of Zinc and Copper Ores . . . . .	389
Petroleum and Natural Gas . . . . .	389
Coal Mining and the War . . . . .	391
What Americans Think of Germany . . . . .	392
Copper Mining in Ontonagon County, Michigan . . . . .	393
New York City's Mining Men, by P. B. McDonald . . . . .	395
The Theory of Tube Milling, by H. A. White (cont'd.) . . . . .	396
Flotation Tests on Cobalt Silver Ores, by H. J. French . . . . .	400
Dome Mines, Ltd., Annual Report, by C. D. Kaeding . . . . .	402
Notes on Homestake Metallurgy, by Allan J. Clark . . . . .	405
Personal and General . . . . .	409
Special Correspondence . . . . .	411
Markets . . . . .	420

## TREATMENT OF ZINC AND COPPER ORES

Following the visit of a Commission on Copper and Zinc Refining to British Columbia, there have been numerous reports from Ottawa intimating that refineries will soon be established in Canada. The published news items are not in close accordance with the facts and are unauthorized. The Commission has not yet prepared its report.

It is the present practice of Canadian mining companies to smelt copper ores and concentrate zinc ores in this country and to ship the smelter products and the concentrates to the United States for further treatment. Such practice has been adopted as the best under the conditions. If, therefore, we seek, for patriotic or other reasons, to change the practice, we should first change the conditions.

There are obvious disadvantages in the present arrangement. The price of metals has risen so sharply in the last few months that producers are making every effort to increase output. The mine output can be greatly increased; but soon the smelting and refining plants will be severely taxed. Then the ore producer may look for further increase in charges and for refusals to accept shipments. It is natural that the smelters and refineries should take advantage of their improved position and endeavor to get a big slice of the profit now being made on metals. The ore producer under the present conditions is severely handicapped by the practice which under normal conditions he believes the best.

That it would be a great boon to the Canadian mining industry to have at this time plants for the complete treatment of all ores mined in Canada is beyond question. It is probably because of the realization of this that the newspapers are printing so many despatches to the effect that it is soon to be an accomplished fact. It is difficult, however, to determine the grounds for such confidence. No noteworthy change in governmental regulations or company plans has recently been announced.

## PETROLEUM AND NATURAL GAS

The Mines Branch has issued the first volume of a report by F. G. Clapp and others on Petroleum and Natural Gas Resources of Canada. The volume deals with the technology, and with methods of exploitation. A second volume will be devoted to the occurrences of petroleum and natural gas in Canada.

The first volume contains chapters on the history, geographical occurrence and production; properties of petroleum; properties of natural gas; geological occur-

rence; preparation for development; methods of obtaining petroleum and natural gas; pumping, storage and transportation; utilization; conservation; and bibliography.

The report has been contributed to by M. R. Campbell, J. H. Gardner, Ralph Arnold, V. R. Garfias, Forrest M. Towl, T. T. Gray, Roswell H. Johnson, and L. G. Huntley. Dr. A. W. G. Wilson prepared the report for publication.

Outside of the Western Ontario field, Canada has few producing oil wells. Previous to the discovery of oil at Calgary there was little public interest in the oil industry and comparatively few technical men had occasion to work in Canadian oil fields. The revival of interest showed that very little information was available. The need for a monograph was apparent, and the Mines Branch is to be congratulated on its effort to gather and disseminate useful information on the oil and gas resources of the Dominion.

Complaint having been made to the authorities that the Britannia Mining and Smelting Company, operating in Vancouver mining division of British Columbia, was employing alien enemies, the Provincial police made enquiries and found that the company had discharged all Austrians and Germans from its employ except three Austrians who were injured while working for the company. In a report to the authorities the company says that it feels under a moral obligation to take care of these injured men, and will not discharge them unless ordered to do so. Two of the men were injured in the recent slide at the Britannia mine, and the other lost the sight of an eye while working for the company.

Such action on the part of the company is to be commended. Those who complained to the authorities may believe that their action was patriotic; but most Canadians will fail to agree with them. Humane treatment of employees must not cease because we are at war.

The medal of the Institute of Mining Engineers, London, will be awarded to Dr. J. S. Haldane. Dr. Haldane has rendered great service to mining, especially with reference to gases in coal mines. He was sent to the front immediately after the Germans began to use poisonous gases and has apparently been successful in providing means of rendering the gas less harmful.

The appointment of Mr. D. A. Thomas, the Welsh coal mine operator, to represent Great Britain in the purchase of arms and ammunition in Canada and the United States will be welcomed by mining men in America. Mr. Thomas has large interests here, besides his interests in a dozen important coal and iron companies in the Old Country. He is regarded as one of the leading business men of Great Britain.

During the past week the British War Office has come in for considerable criticism for showing anxiety

over the supply of spelter. It was said that an opportunity for cornering the market in the United States was thereby created. The subsequent announcement that the War Office's requirements for some time are covered, indicates that the critics were unnecessarily alarmed.

The decision of the Butte miners' union to withdraw from the Western Federation and repudiate the contract between those organizations, is accompanied by the statement that the union paid \$1,000,000 to the Federation and received no benefit whatever. The members of the union have, however, the consolation of knowing that no one else, excepting always the Federation officers and hirelings, has benefited.

The announcement of dividend increases is becoming a common feature of copper mining company reports these days.

The demand for nickel and copper is making itself felt in the Sudbury district. The improvement since last September has been tremendous.

#### IRON AND MACHINERY PRICES ADVANCE.

The heavy buying of railway equipment by Russia and France, the continued heavy demand for munitions, the moderate improvement in strictly domestic demand for nearly all iron and steel products and the prospect for the development of a large amount of business of various kinds in the near future have added very materially to the decided improvement in conditions recently noted. In the case of the three leading rolled products, steel bars, plates and structural shapes, the Steel Corporation and several of the largest independent concerns have advanced quotations \$1 per ton and are so well supplied with orders for the next three or four months that they are not seeking business for that period. It is also true that for delivery during the last quarter of the year, mills are extremely conservative in adding to their bookings.

In the pig iron market activity has been confined largely to basic, for which some orders have been placed in the Philadelphia and Pittsburgh districts. Although the foundry iron market is very quiet at present, sellers are confident that they will soon enjoy some of the improvement which is coming to the finished material market. Merchant stacks report that specifications are going forward satisfactorily.

As a natural result of the continued heavy demand for certain machine tools, especially lathes and screw machines, prices on these machines have again been advanced about 10 per cent. and prices are now approximately 20 per cent. higher than they were when war was declared. It is expected that at an early date prices on nearly all other machine tools will be advanced about 5 per cent. Wages are being advanced by machine tool manufacturers. Many plants are being operated overtime and are finding it impossible to deliver machines as rapidly as demanded by customers. —Iron Trade Review.

Dome Mines, Ltd., has been listed on the New York and Toronto Stock Exchanges.

## COAL MINING AND THE WAR

At the end of February the number of persons from Great Britain's coal mines who had joined H. M. Forces was 191,170, according to a Departmental Committee appointed to inquire into the conditions prevailing in the coal mining industry due to the war. That the number is now much larger is beyond doubt. The coal miners are doing their share of the fighting at the front and doing it nobly.

But the enlistment of so many men for service has embarrassed the mine operators. The committee finds that from returns representing 89 per cent. of the total labor employed in coal mines that the net decrease in mine labor at the end of February amounted to 134,186 persons, or 13½ per cent. of the persons employed in July, 1914, and that there has been, over the seven months, August, 1914, to (and inclusive of) February, 1915, as compared with the corresponding months twelve months earlier, an average fall in output of 3,044,329 tons (or a total loss in output of 13½ per cent.), which loss will continue unless means are taken to prevent it.

The following are extracts from the report:

"We find also that absence from work over all classes of mine workers, on the days on which the mines were open to work, was, for the seven months preceding the war, an average of 10.7 per cent., and for the seven months succeeding the outbreak of war, an average of 9.8 per cent.; and we have arrived at the conclusion that fully 4.8 per cent. of this is avoidable absence. The absenteeism, taking the coal-getters only, is very much higher. And that were there no avoidable absenteeism, the output would be increased to the extent of between 13 and 14 million tons; but perfection in this respect is not to be expected. We believe, however, that the case has only to be put before the miners in order to secure a great response on their part, and we suggest that the body best fitted in all respects to put forward the case is the Executive of the Miners' Federation of Great Britain. We suggest, also, that the question of the curtailment of holidays and 'stop-days' during the war might receive the attention of the same body.

"It is not possible to determine the exact extent of the home demand without very far-reaching enquiry; and indeed, it is very doubtful whether it is determinable, but from the evidence before us and the enquiries we have instituted, we incline to the belief that it is not far from what it is in normal times.

"The loss in production, for the year commencing from the outbreak of the war, will, unless means are taken to reduce the loss, probably amount to 36 million tons, against which must be put a probable reduction in the quantity of coal exported of 24 million tons, leaving a net shortage of 12 million tons. But if the miners continue to be recruited for the Forces, the deficiency will be increased. The evidence before us is conclusive that if labor is further withdrawn from the collieries (notwithstanding the adoption of all possible ameliorating measures) the output will be so reduced as to seriously affect the industrial position of the country, and the time appears to the Committee to have arrived when very full consideration should be given to the question as to whether further recruiting among the miners should be encouraged.

"With reference to the Eight Hours' Act, we suggest that the owners and workmen should confer together and determine to what extent, if at all, the Act should be suspended in individual districts, i.e., to

what class of labor the suspension should apply, and the amount in point of time the suspension should cover.

"We do not advise that women should be employed to a greater extent than at present on the surface of mines.

"We do not suggest that the age limit at which boys can be employed below ground or on the surface should be reduced.

"We have indicated certain directions in which, possibly, internal reorganization in the mines might be further carried out.

"If the restriction of the export of coal to neutral countries is found to be advisable, we have pointed out that special consideration should be given to those mining districts which to a large extent depend on export for the existence of the collieries:

"We think that the importance of economy in the use of coal should be brought before the public. Savings which at once occur to the mind are economies in public and private lighting, whether by gas or electricity, and the manufacture of luxuries which require coal. The rise in the price of coal will no doubt create a tendency towards economy, but we believe that a considerable further saving could be effected if it were brought home to the public that it is a patriotic duty to economize coal during the period of the war.

"The basis of all the proposals and suggestions made by the Committee is harmonious co-operation between employers and employed through the medium of the organizations on both sides thoroughly representative of the parties. Unless the organizations possess this power and are able to act with authority for both owners and workmen, friction may arise and stoppages of work take place which ought to be avoided at the present time to the utmost extent possible.

"In the highest interests of the nation it is especially desirable that during the period of the war the employers should co-operate with the representatives of the workmen on such questions as non-unionism, or other questions likely to lead to any friction or stoppage during the present unprecedented circumstances."

### ALIEN ENEMIES AT SUDBURY.

Under the caption "Enemies of the King" the Sudbury Mining News prints the following:—

"It is understood that steps are being taken to round up all aliens in the Sudbury district. It is a mystery why this has not been done before, for it is well known that large numbers of enemies in this section are doing pretty much as they please, and evidently think that the Canadians are a pretty easy-going lot. For example, at a mine not far from Sudbury, a few days after the Lusitania was torpedoed by the Germans and hundreds were murdered, a gang of Austrians held a big celebration, and as no person here had authority to arrest and intern them, we presume they are still at large. If the regulations governing alien enemies are going to be enforced in this section, it will be necessary to have them all register, especially the ones who hold the high positions, as they are really more dangerous than the ignorant class."

The directors of the Consolidated Mining and Smelting Company of Canada, Ltd., have declared a quarterly dividend of two per cent., total amount, \$116,098, payable July 1.

## WHAT AMERICANS THINK OF GERMANY

By an American Mining Engineer.

An Englishman who recently visited the United States declared that in all London there is not a man who understands America. "And," he continued, "no one understands it. It is too varied, too big, too rapid in its transitions." Of one thing I am sure, the average British newspaper understands America not at all. The news items which they cull from American papers for reprinting in England are one-sided, sensational, and altogether misrepresentative. Like any other country, America is a lot of things at once, with dozens of angles and facets, and it is altogether misleading to select one phase of national life, perhaps a derogatory one, and say that that is the entire nation. Any Englishman would laugh at any foreigner who thought he understood all about England from the reading of a few sensational articles extracted from London's press.

As to what the people of the United States, its one hundred million population, think and feel about the war, about the Germans, about Belgium, about the British and the French, there is one great and significant fact to be taken into consideration. The Americans are not fools! They know what has been going on since last July, are remarkably well informed on every point, and have been deceived not at all. The elaborately prepared German propaganda, of which so much has been heard, has accomplished nothing, nor changed American ideas a particle. To an amazing degree, the whole pro-German defense of her policies and acts has been ignorant, ill-advised, and in the poorest kind of taste. "They have not even caught a glimmer of the American point of view," says the discerning weekly, "Life," of New York.

But why, asks the average Britisher, did not America make a formal protest at Germany's outrage of Belgium, since the United States was one of the signers of the Hague Treaty, which guaranteed the inviolability of the little buffer country? The answer is that it was expressly stated in the same treaty that "under no consideration" was the United States expected to forsake its traditional policy of non-interference in Europe's internal quarrels. America has always made a particular effort to keep free of dissensions, policies, and entanglements which concerned the countries of Europe alone. Such is the natural and logical attitude of a young, growing nation with the ideals and ideas of the U. S. A.

There are among America's one hundred millions of people, a few Germans (not very many) who are Germans first and Americans second. These few are noisy, active, and, for the most part, grossly offensive, and are regarded as such. Ninety-nine and a good-sized fractional per cent. of the population are Americans, first, last, and all the time; thinking and acting as Americans, not as Germans. President Wilson (who by the way thoroughly understands the American people) was right when he said that he relied for support for his measures, not on the noisy few, but on the great mass of quiet, thinking, intelligent men, who in other countries would be styled the middle class, but are very nearly the whole class under the Stars and Stripes.

This great mass of quiet, thinking Americans is the real America, the America that counts. It has thought about the war a good deal. Its thinking is going to have vast and far-reaching effects in the years to come. And it is going to have a bad, a very bad, effect on

Germany, the German people, German schools of thought, German trade and influence, German hopes, desires, and aspirations. The quiet, considered hostility of a great, wealthy, progressive nation with whom friendliest terms formerly existed is no small matter. Germany will learn this as time goes on.

The United States has long been accused of "dollar-chasing" and of caring only for profits and dividends. Partly, this is true, due to the tremendous efforts necessary to make a great and growing population comparatively comfortable over a vast area bristling with exceptional natural difficulties, where long distances, severe climate, and high mountains exacted unusual material effort. But there are other sides to the national character besides dollar-chasing. There is much keen, discerning common-sense, a capacity for understanding other peoples and nations, a strong feeling against autocratic "you-must-do-this-or-that," and a surprising amount of hidden sentiment which ultimately manifests itself in an unmistakable way.

Nearly every American reads the newspapers, he is well informed, he is relatively prosperous; beneath his practical, material exterior lies an amount of sentiment that is no less powerful because it is normally quiet. This undercurrent of feeling and thought constitutes that potent force which indirectly governs America—public opinion.

After the war Germany will reap a harvest of hate. America will furnish part of it. Where formerly was a good-natured tolerance, a certain amount of admiration, and a respectful friendship in business, education and generalities, there have loomed up an overwhelming dislike and a vast disgust. In the most telling and extraordinary manner, Germany has taken in every one of her acts since the first whisperings of war, the very step to sink her fathoms deep in American distrust. By explaining and excusing these acts, she has but still further stained herself, saying exactly the wrong thing in the wrong way, and has antagonized every decent instinct of the American people.

America believes in public opinion. The United States is governed largely by public opinion, and puts a great trust in its ultimate efficacy. Germany will realize for many years what she has lost in American public opinion. It will count against her in numberless unseen ways.—P. B. McD.

### RUSSIAN PETROLEUM.

According to "The Petroleum Review," the idea of forming a petroleum state monopoly in Russia has been abandoned, and in its place there is now under investigation the question of forming a shareholders' company composed of the main producing firms in the Baku district with the participation of the state.

The interest of the Russian State in petroleum is very wide, the state appearing not only as the owner of large petroliferous areas in various parts of the Russian Empire, but also as the owner of enormous natural reserves of oil on the now well-known percentage basis. This is formed of a levy in kind on the production of areas owned by the state, and leased by the latter to the producers against payment in kind. The state is also a consumer of very large quantities of petroleum products, and therefore the interest of the State in the petroleum production is considerably wider than the simple regulation of the production itself. The consumption of fuel alone by the state railways amounts to about 80,000,000 poods a year.

## COPPER MINING IN ONTONAGON COUNTY, MICHIGAN

The improvement during the past few months in the price of copper is being felt in the copper mining camps throughout America. The brisk demand for the metal lends special interest to the opening of new properties and the reopening of old ones. Copper is being sold months ahead by many of the large producers and great efforts are being made to increase production. In spite of these efforts the demand shows no sign of abating. On the contrary the price seems more likely to rise than to fall.

The Michigan copper mining district is now experiencing great prosperity as the result of the improved conditions. This is especially so in Houghton county, where are located such well known mines as the Calumet & Hecla, Tamarack, Osceola, Wolverine, Centennial, Baltic, Champion, Superior, Quincy, Trimountain, Franklin and Isle Royale. Unusual interest attaches, however, to recent developments in Ontonagon county, where the ore deposits are more varied in character and where the operating difficulties are many.

During the past few years the returns from mining operations in Ontonagon county have been meagre. Years ago profitable operations were carried on there, and conditions at present promise well for a revival of prosperity. In the old days the Minesota mine made Rockland one of the bright spots in Northern Michigan and gladdened the hearts of shareholders with its richness. The Minesota Mining Company paid \$1,820,000 in dividends. Other operators were less fortunate, and, although several lodes have been opened, no other mining companies operating in the county have taken a place on the list of dividend payers. Profits are, however, now reasonably anticipated by some of the operators.

During the past decade Ontonagon has figured as a copper producing district chiefly because of the operation of the Michigan, Mass, and Victoria mines. Development work has been actively carried on at several properties, notably at the White Pine and Lake. The Michigan is considered worked out and was closed down a few years ago. Mass and Lake were closed down in 1913 and 1914 during the Western Federation strike. Victoria has been operating continuously, but the low grade of its ore has prevented a profit being made when the price of copper is low. At the White Pine exploration and development work has been carried on steadily, and the mine now is for the first time a producer.

The White Pine is isolated from the other Michigan copper mines, and its ore is of a different character. Its entry on the list of producers is an event of considerable importance. Some notes on the developments of mines in Ontonagon county may therefore be of interest.

**Early Mining in Ontonagon County.**—Mr. Charles E. Wright in his report as Commissioner of Mineral Statistics, Michigan, 1880, gives the following account of early mining in Ontonagon county:

"The first great impetus given to the mining interest in this county was through the discovery of the Minesota mine in 1847 by Mr. S. O. Knapp. He was led to the discovery by examining the indentations which were plainly discernible along the surface outcrop of the vein, and which proved to be ancient mining excavations. This was the first discovery of the "Indian diggings," which have since been found to

exist everywhere in the copper region. One of the principal pits opened by Mr. Knapp was found to have penetrated the vein to a depth of 27 ft., and was filled up with an accumulation of dirt and partially decayed vegetation. At 18 ft. from the surface a mass of nearly pure copper was found, weighing upwards of six tons. This mass had been raised from its original bed, a distance of 5 ft., and secured there on timbers, which had been placed under it. The timbers, however, had decayed, and the mass remained in its place, supported by the soil which had imbedded itself around it. The mass had been hammered all over until its surface was entirely smooth and the adhering gangue, or rock crystals, was almost wholly removed. In this pit, as in others when cleared of the rubbish which filled them, were found great numbers of stone hammers, bits of burnt wood, a copper chisel with a socket for holding a handle, etc. Directly over this mass, deriving its support from the soil and debris which nearly filled the pit, stood a hemlock, which showed, when cut, 395 distinct annual rings of growth; and this was standing by the side of a much larger stump of a tree that had grown up and gone to decay since this pit had been excavated, and the mass of copper found beneath its roots had been raised from its bed, and the brands which were found beneath it had been burned, and the long period of time had elapsed necessary for the accumulation of the soil that filled the pit and supported the organic growth.

"The rich promise afforded by the discovery of this mass of copper was greatly increased by the speedy results which further explorations immediately developed, and was subsequently in the highest measure fulfilled in the abounding prosperity of the company.

"Four years later the National Mining Company began its prosperous career, and opened its mine on the adjoining location. These two companies, among the most profitable mining enterprises ever organized on Lake Superior, gave to the Ontonagon mineral district a wide celebrity, and for nearly twenty years it enjoyed a comparatively high degree of material prosperity."

The successful operation of the Minesota mine naturally led to the exploration of neighboring properties. The ore-bearing rocks were found to extend for several miles, and copper in promising quantities was found in many places. Many companies were formed and several lodes were opened up. In some cases mining was extensively carried on; but after temporary successes nearly all such operations in Ontonagon county resulted in losses. Besides Minesota and National a regular production was made in the fifties by the Adventure, Aztec, Bluff and Ridge mines. Later the Mass, Belt, Evergreen, Knowlton, Ogima, Victoria and Lake appeared as producers.

The Mass Consolidated Mining Company owns a large area which is traversed by several copper-bearing amygdaloid lodes, known as the Butler, Evergreen, Ogima and Knowlton. During the past few years, the Butler lode has been extensively developed and the mine put into shape to produce a large tonnage. Under present prices this ore should yield handsome profits.

The Mass has been put into good shape by Superintendent E. W. Walker and but for the strike of 1913, would probably have begun to repay the owners for

their expenditures before the war. It has been a long struggle against odds.

In 1912, the last full year of normal operations, the Mass mine produced 132,891 tons of ore yielding 2,045,006 lb. of copper, an average of 15.39 lb. per ton. During the last five months of the year the cost per lb. averaged 14.46 cents, and President J. W. Linnell was led to conclude that during 1913 profits would be obtained. The labor conditions during 1913, however, made it impossible to operate economically and the mine was closed down. It had been demonstrated, however, that the property is a good one. Given a fair chance, the Mass mine should now easily live down its past and take rank with the profitable producers.

**The Victoria Copper Mining Company** has been for several years producing low grade ore at low cost; but, until recently, not making money. The mine is unfortunately located as regards railroad facilities. On the other hand very cheap power from the Ontonagon river is available, a Taylor hydraulic compressor plant having been installed some years ago.

The Victoria mine produced in 1912, 131,955 tons ore, yielding 1,224,911 lb. copper, or about 9 lb. per ton. The profit from operations was \$428. Although the profit was negligible, and was more than discounted by various company expenditures, the record for 1912, when the price of copper was between 16 and 17 cents, indicates that ore yielding only 9 lb. of copper per ton could be mined profitably to-day. During 1913 the company produced 137,163 tons ore yielding 1,428,693 lb. copper, or about 12 lb. per ton. This was sold at 15.4 cents per lb. It cost 15.75 cents.

During the past few years increased efficiency has been obtained, and with high prices ruling, the Victoria should make money. At present, however, it is a one-shaft mine, and is incapable of making a very large production.

**The Lake Mining Company** is developing the Lake lode. This deposit differs in structure from most of those being worked in the district. The beds in the main range west of the Lake mine, dip uniformly to the northwest and strike northeast. The Lake lode where discovered strikes north and dips west. Development proved that the lode bends towards the west. Near the western boundary of the property the lode strikes west and dips south. Explorations on the adjoining property, south Lake, also show the lode dipping south.

Owing to the unusual structure, development of the Lake lode has taken longer than expected. Work was begun in 1906 and some very promising bodies of ore were disclosed in exploratory drifts. The lode is wide and in places rich; but there are considerable portions containing little copper. The hanging wall rock is not easily recognized, and has not been a very useful guide in drifting. There are practically no outcrops which would help in unravelling the structure. The determination of the character of the deposit has consequently consumed much time and money.

In 1912 the mine had been equipped for regular production, and it was expected that good results would be obtained. Unfortunately adverse conditions were encountered, and then in 1913 the strike made it impossible to operate. Recently operations have been resumed and the company now has an opportunity to determine the possibilities of the lode under favorable conditions.

**The White Pine Copper Company** is operating a property in the Porcupine Mountain district, west of Ontonagon village. The mine is isolated and the transportation difficulties have hampered development and

will tend to increase cost of production. The orebodies are much faulted, and determination of their extent has been difficult. Much of the copper in the ore is in very small particles not easily recovered. In spite of these difficulties, however, the mine has been brought to the producing stage and is expected to be very profitable, the ore being richer than that of most Michigan copper mines.

The White Pine orebodies are beds of sandstone carrying native copper and chalcocite. Such deposits were known to occur in this district many years ago and a serious effort to work them was made at the Nonesuch mine, three miles west of the White Pine. The Nonesuch mine was, in 1907 and 1908, tested by the Calumet & Hecla Mining Company. A stamp-mill was installed and fairly good results obtained, but the amount of ore found was small. Later the Calumet & Hecla Company obtained a controlling interest in the White Pine property, where ore similar to that at the Nonesuch had been found. By diamond drilling a promising deposit was located, and exploration by shafts and drifts was then begun. Two beds, known as the "first lode" and "second lode" have been opened and found to be well mineralized. The beds are gray sandstone like that at the Nonesuch mine. The first, or upper lode, is the better. The beds average about 6 ft. in thickness, varying from 4 to 6 ft. They lie parallel and close together, being separated by about 5 ft. of dark colored slate. The hanging wall bed of the upper lode is a thick bed of similar black slate. The footwall of the lower lode is red sandstone, which, at a depth of about 40 ft. below the lode, contains numerous pebbles. This conglomerate phase is fairly persistent and forms a good horizon marker.

It has been found that the lodes are much faulted. In many cases these faults, of the normal type, have allowed blocks to drop in such a way as to increase the apparent dip. In one place faulting of this character has brought the upper lode almost exactly into line with the lower lode.

The property has been developed by three shafts. Two of these are inclined shafts which will be for permanent use. The third is a temporary shaft.

The company reports concerning operations during 1914 as follows: "The openings on the first level west of No. 2 shaft have been rather poor. The second level east of No. 1 shaft has been badly faulted, but shows good values when in the lode. The second and third levels west of No. 3 shaft have opened fair ground, and these two levels between Nos. 3 and 1 shafts are very good. The fourth level drifts, east of No. 3 and east of No. 4 shafts are good as far as opened. Eight thousand tons of ore was hoisted, making about 28,000 tons all from openings, now in stock piles."

Mill buildings were erected during 1914, and machinery has been installed and the plant is now in operation. The concentrates are hauled to Lake Superior and carried thence by water to the Calumet & Hecla smelting plant at Hubbel.

#### ANTIMONY.

The rise in antimony has been as spectacular as in any of the "war metals." A year ago it was selling for 6.87½ cents a lb., and to-day special brands are bringing around 45 cents. French brands are selling at 40 to 42 cents, and Chinese at 36½ to 37½ cents. The big commercial use of antimony is in making of type metal, which is roughly 2 or 3 per cent. tin, 10 per cent. antimony and the rest lead. Because of higher prices of those three metals there has been an advance of two or three cents a pound in certain kinds of type metal.

## NEW YORK CITY'S MINING MEN

By P. B. McDonald.

Most mining men go to New York City at one time or another. Many go back disappointed. A few find things so much easier than they expected that they never cease to talk about how they showed "that New York bunch" several new points. Almost all of them discover that New York is entirely different from what they had thought: it is more honest or more crooked; perfectly sound and businesslike or all bluff; exceedingly well informed or "innocent as a baby;" according to the personal experiences of each one.

Jim Butler, of Tonopah, Nevada, said he "guessed they'd got a permanent camp there alright." Men fresh from the wilds of Alaska, Porcupine, and "the bush" in general, concede that the tram-car service is pretty good. They usually admit that having once learned three or four principal corner-posts, it is not difficult to pace one's way around without a compass, in which respect the American metropolis excels that tangle of labyrinths where copper is sold and Tom Lawson used to operate.

It is not generally recognized that New York is a metallurgical centre of considerable importance, and that within an hour's ride of Wall Street there are some of the largest and most elaborate refining and smelting plants in the world. Of New York's importance in metallurgical lines, both in plants and metallurgists, no one can have any doubt who looks into the facts. As to mining and mining men, there needs to be a word or two said.

In the world of finance New York's position is of course unquestioned, and it stands for "big business" in an unprecedented way. But in mine financing it is weak, and has nowhere near the ability, the nerve, and the understanding of mining as a business which London has. New York has not the discernment, the initiative, or the variety of mining knowledge which one would expect from its position in finance. The vast majority of its bankers positively refuse to have to do with mines, and particularly with prospects. The popular impression of mining ventures in down-town New York is that all of them are crooked, and the successes only accidents. Mining is not taken so seriously as in London. It is to be regretted that mining as a business is not more understood in America's greatest financial centre.

On the other hand there are some points to be said in its favor. New York is rich and powerful and off-handed, and sometimes does surprising things in a mining way; for there are strange paradoxes in the attitude and affairs of the New York financiers. There is a lot of gambling spirit there, and romance is sometimes lurking where least expected. A big, sure mining proposition properly handled has no trouble in raising funds. The chances of a small or moderate-sized venture securing backing depend upon a variety of conditions; the general state of the money market, politics, the weather, a good deal on personalities, and more or less on merit.

Just as there are in the mining camps, men who follow around the new discoveries and booms, prospecting, staking, trying and striving, some honest and some not, so there are in New York keen, shrewd fellows who keep posted on new developments in the different phases of the mining business, promoters, traders, agents, brokers, etc. It is sometimes difficult to distinguish whether they are too crooked to do business with or not. Some have substantial interests in other

lines, and only dabble in mining because it's in the blood; some have surprisingly good connections, though these are not usually so intimate as they say; some are poor and fairly honest, others rich and very shifty. All of them are sharp and opportunists to the nth degree. Occasionally, just as in the camps, one of them makes a killing and from the rank of hanger-on or bluffer springs into fame as a full-fledged president of a mining company or as a successful speculator.

This mining fraternity around New York is a varied, cosmopolitan bunch. They quarrel among themselves, yet will always combine against a greenhorn. They lie to each other, but know that they expect to be lied to. They pass the word around about new developments and new comers.

There are some exceptionally able men among them, keen, hard traders who know more in a minute about driving a bargain than their average opponent knows in a week. Good and bad, honesty, bluff, lies, ability, acquaintance, knowledge, and all, are so inextricably mixed up in New York's mining circles, that one has to be able to accept things as they are, and to play the game as the others do to get results. There is one point to keep in mind in dealing with these men, which is, that while they may not know some of the things that you do about the practical end of the business, you are safe in giving them credit for knowing a very great deal about their end of it.

It is sometimes astonishing with what ease one gains an introduction and admittance to a master of finance in New York's inner circles. And it is equally astonishing to find the type of man some of them are; not nervous, busy individuals with only seconds to spare, which is the usual picture of a captain of industry, but deliberate, clear-thinking men who refuse to be hurried or worried, and whose business day is made up of a few talks carefully gone into. They are exceedingly shrewd judges of men and business opportunities in general, but withal not quite sure of themselves with a mining proposition.

There is, in New York business offices, a vast deal of ability almost incomprehensible to a miner, a perfection of methods that he finds difficult to realize; but there is also a lack of knowledge of mining and of the spirit of the camps which makes for misunderstandings at critical times. It is this apparent non-comprehension of the things that he knows about which so discourages some mining men who come to New York.

Yet reason will show that this absence of co-ordination is only to be expected when conditions are considered. And, despite its shortcomings, New York is the business capital of its country, the greatest, most daring, and most cosmopolitan of American cities. Some particularly deserving cases of mine financing which could secure no support in Montreal, Toronto or Boston, have come to New York, raised the money easily and made successes in operation. But worthy ventures that have gone a-begging in New York have met with instant response in London. The point-of-view of the two great money centres is vastly different. The city on the Thames is consistently on the watch for precious metal, tin, or gem mines, no matter where located, Burma, Bolivia, Siberia, Colorado, Spain or West Africa. The American Babylon wants big, low-grade, sure things most of the time, but has rapid transitions when it will consider other varieties if properly presented. Personality counts for something in New York, individuality is important in London.

# THE THEORY OF TUBE MILLING

By H. A. White.

(Continued from last issue.)

**The effect of varying loads of pebbles.**—The subjoined table III. gives the maximum H.P. observed with the different pebble loads tried, and the number of revolutions per minute at which that H.P. was required. To make this speed comparable for the different diameters of tube employed, the "angle of departure" of the outer layer of pebbles is also given, as this would be approximately the same, under similar conditions, whatever the diameter of the tube mill might be. The sine of this angle is also given, as this function depends directly upon the number of revolutions per minute.

It is convenient to express the height of the pebble load in the tube mill by the distance in inches of its surface when at rest above (+) or below (—) the axis of the tube mill.

It will be observed from the figures given that the most suitable speed (and this is conveniently ascertained from the pebble lifting H.P. quoted), depends to a certain small degree upon the load used when the diameter remains the same. If the load is increased the speed must also be slightly increased to get the best effect; this is accompanied by the spreading out of the layers across the tube, thus giving more room for the fall of a large quantity of pebbles, though a sacrifice in height of fall of the outer layers also occurs. It will be noted that the load 0 in., that is when the tube is half full, gives the maximum power consumption in each case. This is the effect of the compromise between forming more layers of pebbles and maintaining a high average fall of all pebbles present.

In practice, therefore, if the full load (0 in.) cannot be used (because of power available or other reasons), it would in some cases be advisable to reduce the speed, especially for coarse battery crushing where the gain in average fall per cycle of each pebble might be more advantageous than a greater number of pebbles with a correspondingly smaller fall. The problem resembles the adjustment in batteries by reducing the number of drops per minute and increasing the fall in accordance with the product to be crushed.

Upon comparing the angle of departure for the varying diameters of tube used, it will be seen that the smaller tubes require to be driven at a greater speed than that which would correspond with the speed required in the larger tubes; except in the case of the bar liner. This effect is most probably due to slip, which prevents the lighter loads in the smaller tubes being carried up to the theoretical angle corresponding with the speed. The much rougher working surface shown by the ribbed liner counteracts this slip in much the same way as the heavier loads in the larger tubes. In practice the percentage of moisture present may exercise similar effects besides affecting the amount of adhering sand carried up by the pebbles, but in any case it seems probable that a smoother liner would require a greater speed of revolution than is the case with the iron bar ribbed liner, all other things being equal. Subject to slight modifications in accordance with size of pebbles employed and coarseness of primary crushing, it may be deduced that the most advantageous way to run the standard tube (5½ ft. by 22 ft. shell) would be (using silix liners) 31

revolutions per minute with a pebble load up to the centre. If bar ribbed liners are used, the speed would be about 30 revolutions. It is obvious that if thick silix liners are employed, the tube should be driven two or three revolutions faster when a new liner is put in, and this would to some extent avoid the very poor crushing shown in this case, due to the three-fold disadvantages—smaller effectual tube, greater slip, and unsuitable speed.

The visual observations made lent no support to the view that any significant portion of the working ef-

**Table III.—R. P. M. Corresponding With Maximum H. P. for Various Loads.**

Dia- meter	Load.	Net H.P.	R.P.M.	Angle.	Sine.	Liner.
in.	in.			deg., ft		
75	+ 16	5.87	25.4	43 32	.68878	Unlined
"	+ 8	8.14	25.6	44 24	.69966	"
"	0	10.87	25.5	43 58	.69419	"
"	-3.5	10.63	25.2	42 47	.67795	"
"	- 14	8.85	24.5	39 50	.64078	"
66	+ 12	5.23	28.5	49 44	.76304	Concrete
"	+5.5	6.51	28.0	47 26	.73649	"
"	0	7.30	27.3	44 26	.70008	"
"	- 2	6.73	27.0	43 13	.68476	"
65	+ 17	4.42	28.2	47 22	.73570	Concrete
64	+ 6	6.01	28.8	49 4	.75547	Concrete
"	+2.5	6.81	27.6	43 37	.69382	Steel bar ribbed
"	0	7.25	27.0	41 37	.66414	"
"	- 5	6.08	26.4	39 25	.63495	"
62	0	6.39	28.0	43 47	.69193	Concrete
60	- 7	5.04	29.0	45 55	.71833	"
59	+ 12	3.97	31.2	55 1	.81915	"
58	+ 10	4.44	31.7	56 3	.82953	"
57	+ 4	4.79	30.7	49 53	.76455	"
56	+ 2	4.98	31.6	52 45	.79600	"
55	+ 7	4.94	33.0	55 14	.82148	"
"	+ 5	4.80	32.7	50 24	.77051	"

fect is due to grinding between the pebbles, though the slight increase of —90 product obtained when the tube is overloaded is probably made in this manner at a great waste of power. It is obvious that the greater portion of the work is done by impact of the falling pebbles, either directly on the liner, or on pebbles lying on the liner. This being the case, it will obviously be an improvement if the trunnion outlet or discharge screen is made of sufficient diameter to keep down the level of water or fluid pulp to the point that practice may prove most efficient, and the observations also indicate that such level would depend to some extent upon the loading of pebbles employed, in the sense that the smaller loads would require the lower effective discharge levels.

The diameter given is the inside measurement of tube, less diameter of pebbles employed.

The angle refers to angular distance from horizontal diameter at which the outer layer of pebbles leaves the tube lining, and the sine of this angle is given in next column.

In order to further elucidate the facts observed, the subjoined table IV. was prepared, based entirely upon

the theory of the tube mill. This theory is of course based upon the fact that in a moving tube the pebbles begin to fall when the radial component of their weight is equal to the centrifugal force. The observations made show no serious discrepancy with the calculations, except in so far as the wider deductions have to be controlled by the facts observed, and allowance made for the factors which cause complications beyond those it is possible to deal with mathematically.

This table (IV.) illustrates the observed fact that between the loads of 1 in. below the centre and 4 in. above it, there is no very great change in power consumed and probably very little in tons of —90 produced per H.P., provided that the speed is varied accordingly. The given speed, 29.52, corresponds with a maximum of fall in the outer layer which strikes the lining direct, and would therefore represent the speed at which the wear of the liner becomes greatest.

The point of maximum capacity thus calculated is not identical with the point of greatest efficiency, but it is probably the most important for practical use.

**Table IV.—Theoretical Maxima of Pebble Lifting H.P. for Standard Tube Mill with Various Loads.**

Tube mill diameter inside lining, 59 in.  
Pebbles assumed to be 2 in. equivalent diameter.  
Load of pebbles when tube full, 21.92 tons.

Taking the speeds given, the total loads possible at that speed which will allow free fall to all the pebbles is calculated; next the free fall per cycle for the average pebbles is obtained; this multiplied by the average number of cycles per revolution gives the average fall per revolution; from this the H.P. is readily ascertained.

R.P.M.	Pebble Load	Average Fall per Cycle	Average Fall per Revolution	Pebble Lifting H.P.
26.38	in. —15	ft. 3.96	ft. 6.16	41.70
28.18	— 8	3.75	5.46	69.97
28.24	— 7	3.73	5.36	72.51
29.52	— 4	3.57	4.94	81.64
29.74	— 3	3.48	4.78	81.76
30.43	— 1	3.42	4.58	87.20
31.07	0	3.30	4.53	90.09
<b>32.20</b>	<b>+ 3</b>	<b>3.03</b>	<b>3.82</b>	<b>91.43</b>
32.67	+ 4	2.90	3.54	89.22
33.42	+ 5	2.52	3.05	83.50
34.50	+ 7	2.32	2.73	80.88
35.11	+ 8	2.07	2.39	75.93

In actual tube mill operation additional H.P. would be required to overcome friction outside the tube, inside pebble friction, and any power consumed in lifting up portion of the pulp feed (dependent principally upon moisture and feed tonnage). Any overloading with pebbles beyond the figures given for each speed will at first result in increase of H.P. (principally wasted in inner space where no free fall can be obtained), and subsequently the power will fall off owing to reduced fall allowed by the excess pebbles.

**Discussion on Pebble Working Level.**—In practice the pebbles in a running tube are so arranged that the point of impact is everywhere below the axis of the tube. Observations with the experimental tube show that the level, below which all the pebbles have completed their fall, depends upon the load of pebbles and upon the relation between the number of revolutions per minute and the square of the tube diameter.

The level so defined is referred to as the working level; and it is clear that if water or fluid pulp remains in the tube above this level, a certain portion of the effect of the falling pebble will be lost and power thereby wasted. The formation of this level is the only effect that could be dealt with experimentally, but the application of the results will be modified in practice, partly in accordance with the percentage of moisture present and partly owing to the useful effect of the fluid in removing from the tube the particles sufficiently ground. Part compensation is caused by the reduction in effective weight of lifted pebbles owing to their submergence.

Observation shows that this level is not clearly defined, owing to the fact that the pebbles do not fall dead but rebound, either from the lining direct or from other pebbles lying thereon, and that the theoretical curve joining points of impact is materially modified by this effect and by the tendency of the fallen pebbles to heap up to the limit of the angle of repose. In every case the effect of loading pebbles beyond the tube centre is to raise the working level, and this explains the customary 3 in. above the axis, which is the loading used with a high level pulp discharge, the gain being due to saved splash energy, as so large a load cannot be maintained in free-falling flight at the usual speeds.

The important figure to be measured is the effective diameter of the discharge screen which will keep the fluid down to this working level, but it is to be noted that in practice the diameter most suitable may be less than either the theoretical figures or those deduced from actual measurements when pebbles only are present.

Table V. shows theoretical diameters (1) for outside layers of pebbles. (2) for lowest falling pebbles. (This diameter is not directly dependent upon diameter of tube but only upon number of revolutions per minute, and is associated with that inner layer whose "angle of departure" is 37 deg. (45 ft.). Table VI. gives actual measurements of observed working levels, but all the figures in these tables are expressed in terms of the diameter of discharge necessary to lower the fluid outflow to the working level observed.

**Table V.—Theoretical Discharge Diameters.**

Standard tube mill, 59½ in. inside lining, 2½ in. pebbles.

R.P.M.	(1) Discharge Diameter (outer pebbles)	R.P.M. (any tube)	(2) Discharge Diameter (lowest pebbles)
24.9	in. 56	25	in. 62
		26	57
		27	53
28.2	48	28	49
		29	45
31.0	27	30	43
		31	39
32.0	16	32	37
32.6	0	33	35
		34	32

All the above figures assume pebble loading suitable to speeds quoted; any overloading will reduce the diameter of discharge screen required, but the exact relationship is too complicated for calculation.

It is also assumed that area of screen openings is sufficient to prevent backing up of the pulp inside the tube.

Table VI.—Observed Discharge Diameters.

Diam. of Tube (inside lining).	R. P. M.	Pebble Load.	Diameter of Discharge.
in.		in.	in.
62	23.2	— 7	42
“	24.6	— 7	42
“	27.4	— 7	44
“	31.0	— 7	40
“	35.0	— 7	36
66	23.5	— 3	56
“	25.5	— 3	50
“	28.5	— 3	44
66	25.5	0	39
“	28.8	0	36
63	22.2	0	36
“	26.5	0	33
66	25.6	+ 3	43
“	28.5	+ 3	36
60	24.2	+10	14
“	26.0	+10	15
“	27.2	+10	15
“	28.7	+10	17
“	31.2	+10	20
“	32.7	+10	21
61	24.6	+12	14
“	26.5	+12	15
“	29.2	+12	17
“	32.2	+12	22
68	30.0	+14	26
“	30.2	+19	20

The foregoing figures clearly demonstrate that the effect of higher speed of revolution is to decrease the diameter of discharge outlet required, unless loads are very excessive, but that the contrary effect is obtained by increasing the loading of the tube. In any practi-

cal experiments upon variations of screen discharge, by means of scoops or in any other manner, these facts must be carefully borne in mind or the results may only lead to confusion.

**Size of Tube Mill Pebbles.**—The experiments made included all sizes of tube mill pebbles between 1 in. and 4 in. As theory and observation alike indicate that the vertical height of fall in a standard tube mill under normal conditions will vary for different layers between the limits of 40 in. and 14 in., it was decided to determine what size of particles could be broken with pebbles of various dimensions at ascertained heights of fall. Table VII. gives particulars of the results obtained from which the following conclusions may be drawn:—

The weight of the pebble and height of fall are mutually dependent factors, so that a given piece of blanket may be broken by either increasing the weight of the pebble or the height of the fall thereof. It follows that tube mills of greater diameter are likely to be suitable with very coarse battery crushing, and that the only limit to successful tube milling of even products taken direct from the rock-breakers is the mechanical one of size of tube mills and the provision of large enough pieces of blanket to operate in them. By calculation (from the observed figures) it may be concluded that in an 8 ft. diameter tube mill, 2 in. cubes of blanket would easily be broken up by using 8 in. pebbles.

It may be deduced from the figures that 1/2 in. pebbles may be retained within the tube if no coarser screen is used in the battery than 9 mesh, but that when 1/2 in. or 1 in. screening is used in the battery the tube mill discharge should be arranged to elimin-

Table VII.—Height of Fall of Pebbles to Break Particles of Blanket.

Weight of Pebble Used	Diameter of Equivalent Sphere (Assuming sp. gr. 2.7).
28.2 grammes	1.0676 inches
220 “	2.118 “
645 “	3.032 “
1157 “	3.682 “

Size of Particle to be Broken	Height of Fall			
	1.0676 in. pebble	2.118 in. pebble	3.032 in. pebble	3.682 in. pebble
— 1/2 in. + 3/8 in.	42 in. drop does not break particle	19.5 in.	7.0 in.	4.0 in.
— 3/8 in. + 1/4 in.	Do.	9.0 in.	3.2 in.	1.8 in.
— 1/4 in. + 5 mesh (I.M.M.) i.e., — 0.25 in. + 0.1 in.	11.5 in.	1.5 in.	0.5 in.	0.3 in.
— 5 mesh + 8 mesh i.e., — 0.1 in. + 0.0625 in.	1.5 in.	0.2 in.	Very small drop breaks particle	
— 8 mesh + 10 mesh i.e., — 0.0625 in. + 0.05 in.	0.4 in.	Very small drop breaks particle		
— 10 mesh + 16 mesh i.e., — 0.05 in. + 0.03125 in.	0.2 in.	Very small drop or continued rolling breaks particle	Rolling breaks particle	Particle cannot support weight of pebble

ate all pebbles under 1 in., and might preferably be slotted so that flat pebbles with that diameter would be rejected.

It would seem that 2 in. or 2½ in. pebbles are large enough if the battery screening is no coarser than 9 mesh and that 3 in. to 3½ in. pebbles are required if very coarse crushing up to 1 in. screens in the battery is employed. No obvious advantage is apparent in using larger pebbles than those quoted, except to allow for wear by abrasion.

The height of fall is the distance measured between bottom of falling pebble and top of particle to be broken. Chert is the most difficult constituent of the banket to break, mixed quartzite next, and pure quartz the least difficult.

The — ½ in. + ⅜ in. material was practically all quartzite; the — ⅜ in. + ¼ in. had less quartzite, and the — 0.25 in. + 0.1 in. was a mixture of quartzite and quartz in nearly equal amounts. In this case the drop given is that required to break the quartzite. In the remaining cases quartz predominates, and the drop given is that required to break the quartz. In view of the variation in material, no attempt is made to deduce any law of crushing from these figures. The flint pebbles used were subsequently dropped 70 ft. (a) upon a concrete floor and (b) upon a steel plate 1¼ in. thick. The pebbles rebounded vigorously from the concrete floor, but none were broken. Upon the steel plate all tried were broken by the fall into two, three or more large pieces.

**Coarseness of Feed.**—With the standard 5 ft. 6 in. x 22 ft. tube at the Princess Mill, battery screens with 1 in. aperture have been successfully employed, though the pebble chips discharged increased very considerably. This difficulty was not insuperable. With battery screens of ½ in. apertures much less difficulty is met with in this direction, as using ¾ in. holes inside tube discharge screen it is possible to do without the pebble eliminator entirely and to run the entire discharge over the plates where the rounded nature of the escaping pebble chips prevents much interference with amalgamation as the high extraction (75 per cent.) sufficiently demonstrates. Other mines have used or are using ½ in. screens in the battery, but with larger diameter tubes; with the standard tube it must be admitted that the ease of working is very considerably increased if the battery screens are reduced to ⅜ in. aperture. The tube discharge then contains much less very coarse material, and the duty is not very materially decreased (about 3 per cent.). It thus appears that material coarser than ⅜ in. cubes may to some extent escape fracture, and is only gradually worn down to the point where it is certain to be broken and thus released from circuit. Of course, with such feed to the tubes the necessity of keeping up the size of rock fed for pebbles becomes of greater importance.

**Amount of Feed.**—Numerous experiments have demonstrated that the standard tube requires more than 400 tons of sand per diem to produce the greatest possible quantity of — 90 product. The maximum limit has not been determined, and special arrangements will be required to enable much more than 500 tons per diem to be passed through, though the experiment is apparently worth trying. The best feed of course depends upon the length of the tube, as the pebbles right up to the outlet must have sufficient material to work on.

As improvement is shown by eliminating from the feed all material already fine enough, it is clear that the real limit to the length of the tube is reached when the effect of the already reduced material becomes ex-

cessive, and this effect is probably present when the discharged pulp shows more than a half to be of the required size. If therefore the most effective discharge level is ascertained, then the amount of feed it is possible to pass through satisfactorily determined, the correct length of the tube would probably be somewhere near the point at which one-half of the feed has been reduced to the desired size.

**Moisture in Feed.**—Results of experiments upon the effect of different amounts of moisture in the feed with varying levels of discharge have not yet been published. Though it appears theoretically that more water might well be used as the effective diameter of discharge screen is increased, it is probable that the determination of this point will rest upon a compromise between the various effects produced. Taking 38 per cent. to 40 per cent. of water as the most favorable with practically central discharge, a decrease in moisture must increase power required, as the pebbles will lift up an increased amount of adhering pulp. This is partly set off as the increased gravity of the pulp will reduce the effective weight of the pebble being lifted through that portion of its path which is below the pulp level; on the other hand, increased friction would tend to increase the power consumed. With a low level discharge, increased water feed will facilitate the removal of sufficiently fine material without reducing the effect of the blow of the falling pebble by increasing the depth of mud it must splash through.

#### MONEL METAL.

Monel metal is a natural alloy of approximately 67 per cent. nickel, 28 per cent. copper and 5 per cent. other metals, containing no zinc, tin or antimony. The alloy is natural in that the important elements—nickel and copper—bear the same homogeneous relation to each other in the refined metal as in the ore, the refining processes merely removing the undesirable elements. The mines from which the ore is obtained are located in Ontario, Canada, and are owned and operated by the Canadian Copper Company, a subsidiary of the International Nickel Company, who are the sole refiners of Monel metal. The ore is reduced to the form of matte at the smelter, and is then shipped to the Orford works of the International Nickel Company at Bayonne, New Jersey, where the process of refining takes place. The refined metal is then ready to be manufactured into the form of rods, castings, forgings, tubes, wire, strip stock, sheets, etc.

A South Bethlehem, Pa., despatch says Germany is aiding Bethlehem Steel Co. in filling its large contracts to furnish Great Britain and her allies with munitions of war. Adjoining the Bethlehem plant is Lehigh Coke Co., in which Deutsche Bank of Germany has a 70 per cent. interest. All coke and gas which Bethlehem Steel needs to run its blast and open-hearth furnaces and much machinery is procured from the Lehigh Coke Co. Lehigh Coke, furthermore, will soon be making benzol, as it is now putting up a \$350,000 plant for the purpose. It is said that Bethlehem Co. threatened to have the Duponts put up a plant on its property if the Lehigh Coke Co. would not sell coke and gas.

A despatch from Pachuca, Mexico, says Carranza authorities have confiscated \$10,000,000 worth of gold and silver bullion of Santa Gertrudis Mining Co., an English company, and are transferring it to Vera Cruz. Protest has been lodged with British Government.

# FLOTATION TESTS ON COBALT SILVER ORES\*

By Herbert J. French.

For the purpose of this investigation, five variable factors were considered, no one of which is entirely independent of the others:

1. Oil
  - a. Variety of oil
  - b. Amount of oil
2. Amount of acid (only sulphuric acid used)
  - a. Length of agitation
  - b. Speed of agitation
3. Agitation
4. Temperature of solution.
5. Size to which ore is crushed.

The effect of variations of each one of these factors upon the extraction of metallic mineral was investigated in turn, and having experimentally found the best condition for the first factor, this was kept constant, and the second variable then considered. In performing the experiments, however, it was necessary to deviate slightly from this system, but the results obtained from the experiments as performed gave equally satisfactory results.

The machine employed in the following tests was improved to its present form by the Minerals Separation staff, and was given to the School of Mines by James M. Hyde. The driving mechanism was a 1/16 h.p. motor connected to a 110 volt line through a variable resistance. The machine, and its operation are fully described in Hoover's "Concentration of Ores by Flotation," Chap v.

The method of making a test is as follows: Fill the machine with water to a level slightly above the middle. (If it is desired to heat the solution, repeatedly pour boiling water into the machine until the walls have become hot and then fill with water which is near the desired temperature). Add the ore and agitate for a few seconds until thoroughly wetted. When the ore and water have reached the desired temperature, heat being obtained from Bunsen burners, add the acid in the proper proportion. Next add the required amount of oil and turn on the motor, bringing it gradually, but quickly, to full speed by means of the variable resistance. After the required agitation, stop the agitator and allow the emulsion to settle for about one minute to allow time for the froth to collect on the surface of the water and for the gangue to settle. The upper part of the machine is then slid along the plane of contact, carrying with it the froth and that portion of the clean water above the plane of junction of the two parts, and discharging them into a pan. This process may be repeated on the tailing, without or with the addition of more oil; but before further agitation, water should be added to just above the sliding plate. The tailing and remaining water are then withdrawn into a pan, through the bottom spigot, allowed to settle, and the greater part of the water decanted. The tailing is then dried, screened, mixed, sampled and finally assayed or analyzed.

## Treatment of Coniagas Silver Ore.

The ore upon which the following tests were made was obtained from the Coniagas Mining Company, Cobalt, Ont., and represents the material fed to the stamps. The ore contains about 13 oz. Ag per ton, mainly in the form of pyrargyrite ( $\text{Ag}_3\text{SbS}_3$ ), proustite ( $\text{Ag}_3\text{AsS}_3$ ), argentite ( $\text{Ag}_2\text{S}$ ), dyscrasite ( $\text{Ag}_3\text{Sb}$ ), and native silver. The procedure was the same as for the Bisbee ore, but in this case the tailings were analyzed for silver.

The ore was first assayed, using three different charges, with results as follows:

	Charge No. 1	Charge No. 2	Charge No. 3
Ore . . . . .	1	1	1
PbO . . . . .	2 1/4	2	2 1/4
$\text{Na}_2\text{CO}_3$ . . . . .	1	1 1/4	1
Bx. Gl. . . . .	1/6	1/6	1/3
Bx. cover . . . . .	1/3	1/3	Salt. cov.
Ag. found, oz.			
per ton . . . . .	13.61	13.62	13.10

The chief difference between charges 1 and 2 is that the latter has somewhat higher  $\text{Na}_2\text{CO}_3$ , and is lower in PbO. Charge 3 is equivalent to 1 except that a salt is used. Charge No. 1 was selected for the assay of tails, as with this charge frothing was prevented and the slag was cleaner. Charge No. 2 gave equally good results, but the slag did not look so clean as that of No. 1.

1. Variation of Oil.—Preliminary tests were made to determine which oil is best suited for effecting flotation of the values in this ore. Results are given below:

### Effect of Various Oils on Cobalt Ore.

Ore, 100 gm. Water, 1,500 c.c. Agitation, 1 min. Room temperature. Oil, 8 drops. Acid, 1 gm.

Oil.	Wt. of Tails, gm.	Wt. of Froth, gm.	Oz. Ag. per Ton Tails.
Pine-tar . . . . .	97	3.0	9.6
Fish . . . . .	98.5	3.0	12.46
Sperm . . . . .	98	2.0	12.94
Corn . . . . .	84.0	16.0	13.36
Whale . . . . .	98.0	2.0	13.8
Cylinder . . . . .	(a)	...	....
Rapeseed . . . . .	90.0	10.0	10.87
Lard . . . . .	90.0	10.0	13.13
Cottonseed . . . . .	93.0	7.0	12.16

(a) No froth.

The results show clearly that pine-tar oil is far superior to the other oils tried. Rapeseed oil gave a comparatively good extraction, but it was noted that the froth was not so lasting as that produced by the pine-tar oil.

The amount of oil used in these tests was very small, the purpose being merely to indicate the most promising of the oils available, and at the same time to study their selective action. Here again it is seen that of the three or four oils giving the best results, pine-tar oil excels in selective action; whence this oil alone was used in the following tests.

The amount of oil was next varied from 1/3 gm. to 3.6 gm. per 100 gm. of ore. Results are given in Table VIII. This test shows that beyond 2.5 gm. of oil per 100 gm. of ore no benefits are derived from additional oil.

Several tests were then made to determine the effect of adding oil in successive portions. Under the same conditions as above, 2 gm. of oil (50 drops) were added in three parts, the first being 1 gm., and the second and third being 1/2 gm. each. The pulp was agitated each time for 2 min. and the froth was skimmed after agitation with each portion of oil. It was found that the weight of the froth obtained was far too great for good results. In other words, the froth contained nearly two-thirds the weight of the original ore.

\*Extract from an article published in the School of Mines Quarterly.

**Effect of Variation in Amount of Oil.**

Ore, 100 gm. Water, 1,500 c.c. Acid, 1.5 gm. Room temperature. Agitation period, 2 min. Pine-tar oil.

Oil, gm.	Wt. of Froth, gm.	Wt. of Tails, gm.	Ag. in Tails, oz. per ton.	% Ag. remaining in Tails.	% Ag. Extracted.
0.3	7.0	93.5	11.44	84.0	16
0.6	12.0	89.0	10.20	75.0	25
1.0	15.0	84.5	8.25	60.6	39.4
1.3	11.5	90.0	8.28	60.8	39.2
1.6	15.0	87.0	8.68	63.8	36.2
2.3	16.0	87.5	6.66	49.0	51.0
3.0	25.0	78.0	.....	....	...
3.3	22.0	81.0	6.45	47.5	52.5

A similar test was next tried, using half the amount of oil, namely  $\frac{1}{2}$  gm.,  $\frac{1}{4}$  gm. and  $\frac{1}{4}$  gm. The weight of the froth obtained from 100 gm. of ore was 48 gm., while the metal contents of the froth was 48 per cent. of that contained in the ore, again showing that too much of the gangue was carried into the froth.

By using 100 gm. of ore and but  $\frac{1}{2}$  gm. of oil the extraction obtained from three 4 min. periods of agitation was 52.4 per cent. In this test, the oil was all added at first and after 4 min. of agitation the froth was skimmed. The pulp was then agitated for two more 4 min. periods, without further addition of oil, and the froth was skimmed after each period. The weight of the froth in this case was 33 gm. When 1 gm. of oil was added in two equal parts, and the pulp agitated for 2 min. after each addition, the extraction obtained was but 51.6 per cent.

It is to be borne in mind that every ore which can be successfully concentrated by flotation has its own set of best conditions. While those particular conditions mentioned below refer primarily to the ore tested, the general principles are applicable to many if not all ores.

For Coniagas ore—1. Pine-tar oil is the most efficient flotation agent among those oils tested. 2. Oil fractionation, and longer periods of agitation, gave as good an extraction with the consumption of less oil. 3. As this ore cannot be economically treated by cyanidation, it seems probable that, with proper regulation of working conditions, it can be concentrated so that the values may be recovered.

**THE DEVELOPMENT OF ONTARIO OIL FIELDS.**

References to the occurrence of oil, asphalt, and natural gas date back to the earliest history of Canada. Thus Sir Alexander Mackenzie noted the tar springs of the Athabasca region in the "Voyages Through North America to the Frozen Pacific Oceans," 1789, 1793. From that time until the present these tar springs have been commented upon by all the explorers of that region. Meanwhile, as far back as 1830, the settlers in the neighborhood of Enniskillen in Lambton county, in the extreme western part of Ontario, noted the presence of oil in the swamps of that region. The presence of "gum oil" as the material in these swamps was called, was sufficient to seriously detract from the value of the land. Oil was developed from these swamps in 1857, when Mr. Shaw dug a shallow well near Enniskillen, at a place which became known as Oil Springs. In fact, not only does the actual use of oil in Canada antedate the drilling of the Drake well in Titusville, Pennsylvania, in 1859, but in 1857, a Mr. Williams drilled a deep well in Ontario with successful results.

Drake's lucky find caused great excitement in the Oil Springs region in Ontario. This caused careful search to be made for oil indications. By 1860 hundreds of derricks had been erected at Black creek in the town-

ship of Enniskillen. The wells were all shallow, the oil being obtained at 100 ft. more or less. The first flowing well was struck in 1862 by Mr. Shaw at Oil Springs, at a depth of 160 ft., described by Mr. J. T. Henry in the "Early and Later History of Petroleum." This well was struck on Jan. 11, 1862, and before October not less than 35 wells were producing. In spite of the better known development of Western Pennsylvania, there is probably no quarter of the world where the production developed so rapidly in these early days as on Black creek, Ontario, in 1862, on account of the shallow depth at which large gushers were obtained. Several yielded as high as 3,000 barrels per day, three produced 6,000 barrels per day, and the Black and Matthewson wells flowed 7,500 barrels per day, according to Henry.

Shortly after the excitement of Oil Springs, another large oil deposit was struck at Bothwell in Kent county, about 30 miles to the southeast, and in 1865 Petrolia, 7 miles north of Oil Springs, developed a larger field, which led to the desertion of Oil Springs, in 1867, and has been a principal contributor to the Canadian oil industry ever since.

A recently published report of the Mines Branch, Ottawa, contains general information on oil and gas. An account of the occurrences in Canada is to be given in a subsequent report.

**GRANBY'S OUTPUT.**

On June 12 the Toronto Globe published a descriptive article by a staff correspondent, dated from Prince Rupert, B.C., in which the following occurs: "Word is heard here now that the Granby smelter, which has been shipping east to New York and Boston through Seattle, proposes to use the Grand Trunk Pacific line, which will mean from 3,000 to 5,000 tons of traffic per month for the new road." As the only product the Granby Co. ships east is blister copper, the following figures may serve to show how little reliability may be placed on the foregoing statement. Reduced to pounds the quantity would be 6,000,000 to 10,000,000 pounds a month, equal to 72,000,000 to 120,000,000 pounds a year. Now, a statement of the president of the company published in May, includes this information: "At Anyox operations have been continued. . . . The three furnaces are running more steadily and producing at a correspondingly higher rate. . . . Present rate of production is about 3,500,000 pounds monthly from both properties." When that statement was made operations at the company's mines at Phoenix and smeltery at Grand Forks were "now in full swing." When operating uninterruptedly to full ordinary capacity the output of copper from those works was in the 1910 fiscal year 22,750,000 lb., and in 1913 22,686,000 lb. To be well within the mark, say 1,750,000 lb. a month, would fairly represent the ordinary output capacity of the company's Boundary district mines and smeltery. This would leave, with three furnaces running, a similar quantity from the Anyox works. However, to be on the safe side and, as well, to allow for increased output should a fourth furnace be completed and put in operation, say the output may reach to 2,500,000 lb. a month for the year through. This would give a total for the year of 30,000,000 lb., against the Globe writer's minimum of 72,000,000 and maximum of 120,000,000 lb. So it will be seen that readers of that newspaper have been given figures indicating a minimum quantity more than double the probable output and a maximum of four times what there is reasonable ground for expecting.

## THE DOME MINES COMPANY'S ANNUAL REPORT

At the annual meeting the following report covering the operations of the Dome Mines Company, Limited, for the fiscal year ending March 31st, 1915, was submitted by Mr. C. D. Kaeding, second vice-president and general manager.

During the year a total of 265,597 tons was mined and hoisted. Of this, 248,550 tons was ore which went to the mill and 17,047 tons was waste which went to surface dumps. All of the 248,550 tons of ore was milled, resulting in a net yield of \$1,055,496.78, the average being \$4.25 per ton.

### Summary for Year Ending March 31st, 1915.

Total income (inc. \$6,878.41 of miscellaneous earnings) .....	\$1,062,375.19
Operating expenditures .....	\$573,876.68
Development .....	173,319.02
Operating profit .....	315,179.49
	1,062,375.19

hole No. 20 drilled from the surface at a 60-degree angle flattening to 45 degrees showed 478 ft. of \$3.69 ore; that portion of the hole between the 5th and 6th levels shows 4 intersections of ore totalling 119 ft. averaging \$5.63. Hole No. 52 drilled from the 6th level horizontally from a point 40 ft. southwest of No. 2 shaft has shown five intersections of ore totalling 127 ft. averaging \$4.42. Hole No. 53 drilled on the 6th level horizontally, parallel to and 75 ft. east of hole No. 52 showed two intersections of ore totalling 233 ft. averaging \$7.28. However encouraging are these drilling results below the 5th level, both as to values and their indications of tonnage, pending further development they are not included in the estimate of ore reserves, the position of which as at April 1st, 1915, is:

Tons.	Value.	Total.
2782,811	\$4.15	\$11,576,858.71

The net result of actual development has been to place in reserve over twice the tonnage of ore milled

### Operating Costs and Tonnage Milled by Months, Dome Mines Co., Ltd.

1914-15	Tons Ore	Mining Inc. Hoisting	Cost Per Ton	Development	Cost Per Ton	Crushing and Conveying	Cost Per Ton	Reduction	Cost Per Ton	General	Cost Per Ton	Total	Cost Per Ton
April.....	14,710	\$12,939.95	\$.880	\$13,096.27	\$.890	\$2,402.21	\$.163	\$18,340.54	\$1.247	\$ 8,046.39	\$.547	\$54,825.36	\$3.727
May.....	16,180	14,522.52	.898	11,818.03	.730	2,053.16	.17	18,894.99	1.168	8,546.95	.528	55,840.65	3.451
June.....	18,160	13,160.54	.725	13,229.98	.729	2,420.66	.133	17,760.96	.978	9,254.10	.510	55,826.24	3.014
July.....	19,780	12,090.90	.611	17,213.82	.870	2,055.34	.104	17,164.89	.868	8,233.88	.416	56,758.83	2.870
August...	22,110	10,915.48	.494	16,740.93	.757	1,160.69	.052	16,960.39	.767	9,586.02	.434	55,363.51	2.504
Sept.....	21,940	12,770.50	.582	17,943.55	.818	2,477.01	.113	20,284.82	.925	11,118.91	.507	64,594.79	2.944
Oct.....	22,500	10,417.11	.464	18,592.07	.826	3,155.64	.140	21,513.33	.956	11,032.24	.490	64,710.39	2.876
Nov.....	22,040	17,318.39	.785	13,044.20	.592	4,176.70	.190	23,132.48	1.050	8,793.98	.399	66,465.75	3.016
Dec.....	23,090	16,597.33	.719	9,207.99	.399	3,370.92	.146	24,766.50	1.072	10,254.22	.444	64,196.96	2.780
Jan.....	23,220	16,431.65	.708	11,896.35	.512	2,938.00	.127	23,592.69	1.016	8,507.91	.366	63,366.60	2.729
Feb.....	21,600	13,604.54	.630	14,085.36	.652	2,657.02	.124	22,056.49	1.021	8,195.54	.379	60,616.95	2.806
Mar.....	23,220	18,840.06	.809	16,450.47	.709	2,520.34	.108	23,934.30	1.030	14,967.55	.640	76,712.72	3.300
Total..	248,550	169,608.97	.682	173,319.02	.697	31,405.69	.126	248,407.38	.990	114,816.89*	.461	737,557.95*	2.967

\*Total carries a credit of \$1,720.80 for Misc. Income.

**Operating Costs.**—The total operating cost per ton milled for the year, including all development and diamond drilling, but excluding depreciation, was \$2.967, which compares with \$4.197 for the preceding year, the decrease being \$1.230 per ton. This reduction is due to the larger units of operation, improved methods, and to greater efficiency in all branches of the work. Details of operating costs by months will be found in an appended table.

**Development.**—The development work has been distributed on the various levels and within a zone 1,500 ft. long by 400 ft. wide. Besides definitely determining the two million tons "indicated" by incomplete development a year ago in the vicinity of No. 2 Shaft there has been developed, in addition, a large body of better grade ore on the 4th and 5th levels of a character similar to that originally milled from the so-called "Dome." This latter ore has its apex it would seem, at the 3rd level, or 260 ft. vertical from the surface. At the 4th level, 330 ft. vertical it is 330 ft. long and 120 ft. wide. On the 5th level 424 ft. vertical it is 160 ft. long and 60 ft. wide. Below the 5th level and extending to the 6th level a vertical distance of 130 ft. the latest results obtained by diamond drilling have been satisfactory, and indicate a further tonnage. In the earlier drilling, as stated in previous annual reports,

during the year containing nearly three times the amount of gold extracted.

### Development Work Details.

Level.	Drifts.	Cross-Cuts.	Raises	Box-holes	Shaft.	Total.	Diamond Drilling.	Total.
1st .....	98	632	268	360	..	1,358	..	1,358
3rd .....	700	811	330	..	..	1,841	900	2,741
4th .....	297	389	208	..	..	894	..	894
5th .....	581	372	311	172	..	1,436	1,622.5	3,058.5
6th .....	295	207	109	..	..	611	1,192	1,803
Shaft .....	..	..	..	..	83	83	..	83
Surface .....	..	..	..	..	..	..	2,160.6	2,160.6
Total .....	1,971	2,411	1,226	532	83	6,223	5,875.1	12,098.1

Enlarging and straightening drives, station construction, sumps, 85,000 cubic feet.

The expenditures incurred in the above work \$173,319.02, averaging \$.697 per ton of ore milled, has been a direct charge upon current operations.

**Plant and Equipment.**—The completion of the extensions to the mill, power house equipment, mine equipment, etc., begun last year necessitated an expenditure of \$106,792.49 for plant.

**Mill.**—The addition to the milling plant was completed and put into operation in June, although the merging of the new and old units was not completed until August. It was not considered advisable to crowd the plant for tonnage at the start, but rather to bring it up to a maximum output on a sound basis

of operating efficiency, and the expected duty of 28,000 tons per month should be reached and may be exceeded during the coming year.

During the year the plant operated a total of 342 days, or 93.7 per cent. of the total possible time. The following table gives the ore value, bullion and recoveries:

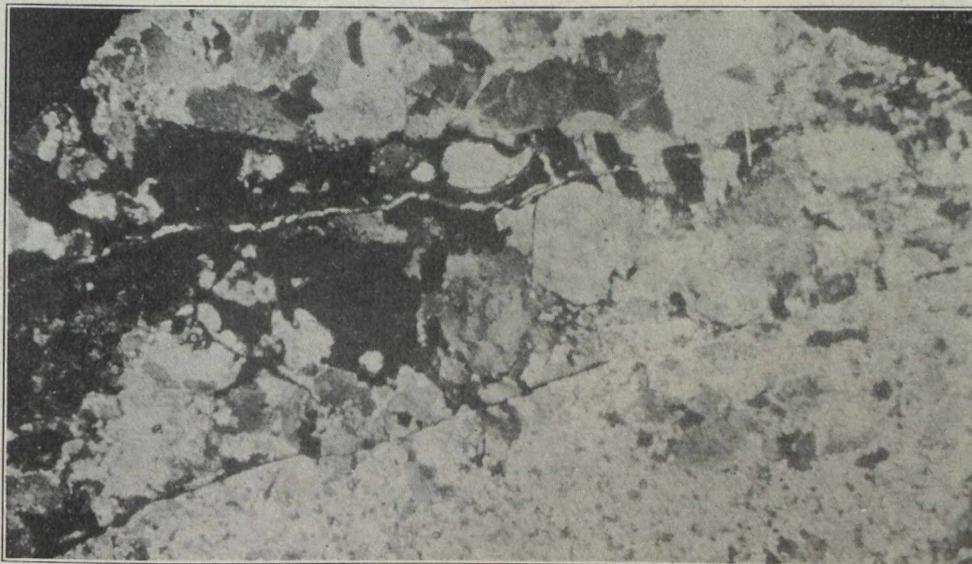
		Per ton.		Pct. Extraction.
Value of ore sent to mill . . . . .	248,550 tons	\$4.68	\$1,163,954.80	90.6
Bullion by amalgamation . . . . .	\$671,054.44	\$2.70		57.6%
Bullion by cyanidation . . . . .	384,442.34	\$1.54		33.0
<b>Total Bullion . . . . .</b>	<b>\$1,055,496.78</b>	<b>\$4.24+</b>		<b>90.6</b>

Minor adjustments only have been found necessary, such as increased thickener capacity, improvement of elevating system, adjustment of launders and classifiers, etc. An increase in the amalgamating plate area is in process of erection, as a greater extraction by amalgamation is expected. The operating cost of \$0.99 per ton bears the burden of the improvements and alterations. This cost has been reduced from the previous year's figure of \$1.440, amounting to a saving of \$0.45 per ton milled.

The metallurgical results as set forth here indicate

underground, a large underground crusher, automatic loading hoppers, four ton skips, and a surface haulage with five ton cars to the crusher house from No. 2 shaft. The skips have already been installed and are operating, and the loading station and ore pocket below the 5th level completed. The crusher station and ore passes are fifty per cent. complete. It is hoped to have this system operating by the summer.

A system of shrinkage stopes has been laid out underground on the 3rd and 5th levels and breast stopes cut, with boxholes and chutes completed, so that a large stoping area will soon be available for underground mining. An increasingly greater tonnage will be taken from these stopes from month to month and it is anticipated that the cost of mining can be held level as the stoping efficiency is improved. Average operating costs for the year suffered from two high months at the start and one at the end of the year, the latter due to a shortage of hydro-electric power. From August on, the cost of all supplies and equipment advanced materially, due to war conditions in general and to increased tariffs affecting all manufactured articles, as well as raw materials. The adoption of the Workmen's Compensation Act on January 1st has been an added tax, but one which we welcome, as placing upon a sound



Microphotograph of Dome Mine Gold Ore

that the practice adopted is sound and economically of a high order. Additional knowledge gained by further experience with the ore will indicate refinements of present practice.

**General.**—The physical condition of the property is better than it has been for some time past. Proportionately larger amounts have been spent upon repairs and improvements resulting in larger and better air and steam mains, improved heating, better houses and offices, roads, etc. The small 16 cubic feet ore cars used for tramming and hauling ore on the main level and up the incline shaft to the crusher house have been replaced by 93 cubic feet cars. This work entailed the enlarging and straightening of drifts, relaying several thousand feet of track with improved equipment, constructing a head frame, bins and grizzlies. The cost of these improvements has been a charge against current operating; the cost of crushing and conveying during the year has, however, been reduced from \$0.252 per ton to \$0.126.

To further facilitate the handling of the ore a system is being installed consisting of five ton cars for use

and equable basis the distribution of compensation for injuries sustained at the work.

A further reduction in the operating costs during the next fiscal year may be expected.

**Balance Sheet, Domes Mines Co., March 31st, 1915.**

Assets.	
Cost of properties . . . . .	\$2,575,000.00
Buildings and equipment as at March 31st, 1914. . . . .	\$1,178,878.45
Expended for additional construction and equipment during the year less salvage recoveries. . . . .	106,792.49
	<hr/>
	\$1,285,670.94
Deduct amount written off for depreciation, extraordinary repairs and improvements. . . . .	136,601.04
	<hr/>
	1,149,069.90
	<hr/>
	\$3,724,069.90

Current Assets—		
Inventories. . . . .	\$102,921.40	
Accounts Receivable . . . .	60,760.08	
Advances. . . . .	9,379.18	
Insurance Unexpired . . . .	1,641.82	
Interest Accrued . . . . .	1,854.15	
Cash. . . . .	307,484.06	
		484,040.69
	Liabilities.	\$4,208,110.59
Capital Stock . . . . .	\$5,000,000.00	
Deduct-in Treasury . . . . .	1,500,000.00	
		\$3,500,000.00
Current Liabilities—		
Accounts Payable . . . . .	\$42,211.94	
Taxes Accrued . . . . .	800.00	
		43,011.94
Surplus—		
April 1st, 1914 . . . . .	\$486,520.20	
Profit and Loss (balance as per attached account)	178,578.45	
		665,098.65
		\$4,208,110.59

#### CANADIAN COAL AND COKE CO.

Shareholders of Canadian Coal and Coke Company, Limited, are being circularized by the directors to secure their co-operation in a plan for relieving the company of its prior lien obligations, which, it is now clear, cannot be met from the earnings of the property in the present depressed state of business in the West. The holders of these prior lien obligations, which amount to \$300,000, due October 1st, 1915, and are owned by the First National Bank of Cleveland, have consented to transfer these obligations to a new company, to be formed by the shareholders and bondholders of Canadian Coal and Coke, for the sum of \$18,000 cash for interest in advance to July 1st, 1916, and six successive payments of \$50,000, with interest at 8 per cent., at the beginning of each half-year commencing July 1st, 1916, these payments to be secured by deposit of the \$300,000 prior lien obligations themselves and of negotiable promissory notes of the subscribers to the new company's stock, maturing to correspond with the dates of payment. The new company is to secure stock subscriptions of at least \$450,000 at par, and to have an authorized capital of a million, and \$200,000 of this is to be allotted to the holders of the collateral trust notes—a further obligation of the Canadian Coal and Coke Company, amounting to one million dollars.

The new company has been formed and capitalized as above, under the title of North American Collieries, Limited, and the stock is now being offered to the noteholders at one hundred-dollar share for each \$500 note of the collateral trust notes (of which there are roughly a million dollars), and, in case of cash purchase, at par. The necessary \$450,000 in cash subscriptions required by the bank has been secured. The noteholders, who alone are entitled to participation in this subscription, are, however, offering to shareholders an opportunity to acquire notes at the original price, namely, 94 and interest, these notes conveying the obligation to convert into stock of the new company at 20 per cent., and also the right to purchase stock of the new company at par. The amount of stock which may be taken by each noteholder will depend upon the success of the subscription.

There being no other fixed charges (no bonds of Canadian Coal and Coke have ever been sold outright) the new company will be in a position to take over the property free of all interest obligations, and with a considerable amount of working capital, and with a stock liability of only one million dollars. There will be no bonus stock, commissions or water of any kind.

A more drastic liquidation of the original company's liabilities could hardly be imagined, but it seems to be thoroughly justified by the situation. Except for their right to take rank with the collateral trust noteholders on the same terms as if they had originally subscribed for notes, the common and preferred stockholders have no equity left them; and the preferred stockholders, it will be remembered, were originally bondholders. It is not, however, now a question of the propriety or otherwise of the original financing, but of securing for the original owners a right to save the property from falling into the hands of the prior lien creditors for a mere \$300,000 indebtedness.—Financial Times.

#### THE METAL SENSATION.

Boston, June 14.—“Not in your time nor in mine is there likely again to be a situation in the metal markets such as exists at present,” says an important copper producer. “Nor has such a situation ever existed in the past. The enormous consumption of metals is one of the great surprises of the war and in which the United States is a most fortunate beneficiary.”

The changes both in price and the relative importance of the metals have been kaleidoscopic. The spotlight has fallen in turn on copper, spelter, lead and tin, with aluminum, quicksilver and other metals coming in for more or less attention. Sales of electrolytic copper have been made at 20¼ cents, which compares with 19 cents last week and an average of 13¾ cents for the year 1914.

Calumet and Hecla grades of Lake copper could be sold at 25 cents through the balance of the year, but we have heard of no actual sales above 23 cents, as the company has been “out of the market” for some time.

Spelter is the big sensation. Even at to-day's price of 25 cents, which is a nominal quotation and is three or four cents under the recent top, it shows an advance of 371 per cent. over the average for the year 1914, of 5.3 cents.

Lead has been a laggard, and only within the past week or two has it joined the company with the other sensational metals. A week ago it was selling at 4.90 cents; to-day at 7 cents.

Tin has benefited relatively little by the war demand. Aluminum, by reason of its ability to compete in some measure with copper, has advanced 60 per cent. from the average of 1914, but this advance has taken place very recently.

Quicksilver, in which Boston capital has for years had a small investment interest, is up 90 per cent. over the average of last year.

Silver is the big disappointment. It is actually selling to-day 5 cents per ounce less than the average of 1914.

In the Companies Winding-up Court of the Chancery Division, London, June 22nd, the petition of G. F. S. Bowles re Tough-Oakes Gold Mines (English company), was allowed to stand over for evidence.

## NOTES ON HOMESTAKE METALLURGY\*

By Allan J. Clark.

It is nearly three years since the metallurgy of the Homestake ore was discussed with considerable thoroughness, in a paper† read before the Institution of Mining and Metallurgy.

Certain changes have been made in this period which are perhaps of sufficient interest to justify a brief description, and it is chiefly with such details and miscellanies that this paper will deal. In the circumstances, a certain amount of repetition is inevitable, but matter treated of in the former paper will be referred to here only when it is necessary for the sake of coherency. For full descriptions of equipment and technique, the former paper should be consulted.

The mineralized slates and schists which constitute the ore vary considerably in composition, but the unoxidized ore, perhaps constituting the major part of the reserves, contains either chlorite or hornblende (cummingtonite), with quartz, carbonates, of lime, magnesia and iron, and arsenopyrite, pyrite, and pyrrhotite. Ferrous minerals predominated and this fact has been an important factor in determining the metallurgical treatment.

With one or two exceptions the minerals noted are of relatively high specific gravity, and the ore as a whole is exceptionally heavy, many determinations giving an average specific gravity of 3.00.

This high specific gravity presents one decided advantage, when the cost of treatment is compared with operations elsewhere, in that the ton, almost universally the basic unit, represents a volume probably less by 10 per cent. than that of many gold ores. On the other hand, this high gravity renders more difficult the discharge of pulp from mortars, its distribution on amalgam tables, and its transportation in launders.

In the same way, as attesting the usual balance of such variations of different ores, it may be noted that the needle-like fibres of hornblende (cummingtonite), interlacing throughout the mass, render the ore more difficult to crush than would be anticipated, but on the other hand assist in maintaining free leaching in both sand and slime treatment, retaining their characteristic form as far as they can be traced with the microscope.

The metallurgical equipment consists of:

At the South Side—3 stamp mills (660 stamps) with 36,356 sq. ft. of amalgam plates; 1 regrinding plant, with independent cone system and 540 sq. ft. of amalgam plates; 4 batteries of cones for classification; 3 clarifying-tank houses; 1 sand plant.

At the North Side—2 stamp mills (360 stamps); 2 tank houses; 2 cone houses; 1 sand plant.

At Deadwood—1 slime plant, treating the combined slime from south and north sides.

The ore supplied to the north side mills is usually drawn from the upper levels of the mine, and is at least partly oxidized. It is more easily penetrated by cyanide solutions than is the unoxidized ore, and satisfactory extractions are at present made from the sandy portion of the mill tailing without further reduction in tube mills. In almost all other respects, practice at the two divisions of the works is identical and unless otherwise stated further description will be of operations at the southern branch.

### Stamp Milling.

The stamps, when newly shod, weigh 900 lb. and drop 10 in., making 88 drops per minute. Pulp dis-

charges through No. 8 diagonal needle-slot screens. Inside amalgamation is practised, quicksilver being fed to the mortar, and a copper chuck-block, about 5½ in. wide, being placed inside the mortar, below the discharge screen. To facilitate discharge and distribution of the pulp over the amalgam plates, water is liberally used, the usual ratio being from 10 to 11 parts, by weight, to one of solids.

Electric drive, now in use for more than two years permits more nearly continuous operation than formerly. A 25 h. p. back-gear motor drives each 10 stamps, transmitting motion by a 16-in. belt.

Chuck-blocks are cleaned in rotation, the usual interval between cleanings being about two weeks; outside plates, except those of the fourth row, are cleaned and dressed daily. Fourth-row plates are dressed at intervals of two days. At the foot of the rows of plates are traps, from which the sands are removed every second or third day. These trap sands are run over a special silvered amalgam plate, the tailing rejoining the main stream of tailing. It was formerly the practice to clean these traps daily, but this is not necessary since the development of the regrinding plant, which acts, in effect, as a large trap for all the mills.

Amalgam is restored three times each month. Oil-fired retorts are used, the resulting bullion being melted in coke-fired furnaces. The loss of quicksilver in retorting is almost nil; the subsequent melting loss, which averages slightly more than 1 per cent of the weight of the crude bullion, includes some quicksilver not driven off in the retorts.

A new mortar has recently replaced the familiar design. In this newer design the old "inside lines," remarkably effective in maintaining a rapid discharge, have been retained. All the front above the screen rest has been cut away, as has also a considerable portion of the back. This has given greater accessibility, with resulting safety to the men when engaged in changing iron and other necessary operations; it permits the use of longer bossheads and simplifies the care of feeders, since an observer at the front of the mortar can determine whether the ore is feeding properly. The slight tendency to splash at the back is corrected by a false back, or apron, of canvas; a small chip tray of 4-mesh screen, resting above the discharge screen, impounds floating particles of wood, which are removed from time to time, washed, and burned. The ashes, which assay as high as \$300 per ton, are set to accumulate in sufficient quantity and are eventually sold.

The unoxidized ore, although carrying large quantities of sulphides, amalgamates well, but not so freely as old records show to have been the case in earlier years, when less of this class of ore came to the mills. A longer time is apparently required to properly incorporate the quicksilver with the pulp, and the resulting amalgam is recovered somewhat farther from the battery.

"Skimmings" are recovered from re-treatment of the foul amalgam, sulphide particles, etc., removed from the cleanup sink during the cleanup of the chuck-block and plate amalgam.

These cleanings are re-treated with an excess of mercury in a small barrel 24 in. in diameter by 302 in.

\*Extracts from a paper to be read at the San Francisco Meeting, American Institute of Mining Engineers, September, 1915.

†Clark and Sharwood: The Metallurgy of the Homestake Ore, Transactions of the Institution of Mining and Metallurgy, vol. xxii., page 68 (1912-13).

long, in which iron balls or pebbles are placed, the mineral particles being ground and the amalgam recovered. The rejected sulphides, carrying perhaps \$1,000 per ton in gold, are briquetted with water glass and charged to the blast furnace, when smelting cyanide precipitate or by-products.

**Relation between amount of mercury and bullion recovered.**—It is perhaps not customary to report inquiries which have failed of definite conclusions. The following notes of such an investigation are not without interest, despite the lack of decisive result. Records of all six mills were tabulated over a period of one year, in an effort to determine what relation, if any, existed between the amount of quicksilver fed to the batteries, the amount of bullion recovered, and the grade of the ore crushed. As was to be expected, individual determinations varied considerably from the average, but for four of the mills, and these fortunately including those crushing ore of the two extremes in value, the points coincide reasonably well with a curve represented by the equation

$$T = \frac{8.5 B - H}{H}$$

when

T = Value of ore (dollars per ton).

H = Troy oz. of quicksilver fed to batteries.

B = Troy oz. crude bullion (\$16 per oz.) recovered.

Of the two remaining mills, one was crushing surface ores with comparatively coarse particles of free gold. This, not unreasonably, showed values for H about 10 per cent. below the values indicated by the equation. The sixth mill gave results nearly 20 per cent. higher than might have been expected. This mill, on account of an insufficient supply of water, crushed nearly 10 per cent. less ore than the average and it is conceivable that the longer retention of the material in the battery caused undue flouring of the quicksilver. It is more probable, however, that the explanation is to be found in the personal equation of the millman in charge.

**The crushing units** are not in conformity with modern ideas, and there is no doubt that, were the plants to be built anew, radical changes in design would be made. The Homestake, unlike many younger mines, has developed gradually from comparatively small beginnings. The mills represent the growth of 30 years. Built before the cyanide process was known, they then represented advanced milling practice. It must be conceded that the stamp duty of 4½ tons, with 80 per cent. of the tailing passing a 100-mesh screen and 60 per cent. passing a 200-mesh screen, is fairly good even when compared with the results reported from many newer installations.

We find that heavier stamps crush more rock, with little or no change in the sizing of the tailing unless more open screens are used; in which case, even without increasing the falling weight, tonnage may be gained at the sacrifice of sizing. To us it appears that compactness of plant, with the saving both in first cost and, later, in labor and supervision, constitutes the leading claim of the heavy stamp for preference. Indeed, if the gold metallurgist is ready to dispense with amalgamation—and we are by no means prepared to do this—it is more than probable that he will do well to investigate the crushing practice of modern copper mills before he commits himself to the heavy gravity stamp. Alaska, at the moment, holds more of interest than does Africa.

It may be pertinent to note that I have never encountered a Homestake mill tailing, no matter how far advanced in secondary treatment, from which some

free gold could not be recovered by laboratory amalgamation tests.

Sundry operating and cost data of stamp milling are appended:

#### Stamp Mills: Analysis of Lost Time.

Note.—The time devoted to dressing plates, about 10 battery-minutes daily, is in part included, as whenever possible the work on the battery is done during this period of plate dressing. Data of 660 stamps for 59 consecutive days.

Reason for Loss of Time.	Battery Hours.
Installing new screens . . . . .	69:20
Installing new shoes, dies, heads . . .	194:40
Installing new guides, guide castings .	10:35
Installing new mortars . . . . .	63:55
Installing new tappets, cams . . . . .	20:00
Installing new cam shafts . . . . .	6:25
Installing other equipment . . . . .	37:00
	<hr/>
Setting tappets . . . . .	685:10
Pull-outs of stems . . . . .	122:20
Broken stems . . . . .	343:05
Broken shoes and dies . . . . .	15:10
Loose cams . . . . .	39:50
Miscellaneous repairs . . . . .	120:05
Motor trouble . . . . .	253:20
Drive troubles . . . . .	5:20
	<hr/>
Total lost time . . . . .	1,986:15
Total battery hours . . . . .	186,912
Percentage of total time lost . . . . .	1.07

#### Cost of Stamp Milling.

	Amalgamating.		
	Stamping	Normal Charges.	Rebuilding Plate House.
Operating labor . . . . .	\$0.0895	\$0.0164	
Other labor . . . . .	0.0033		\$0.0064
Power . . . . .	0.0457		
Machinery . . . . .	0.0628		
Water . . . . .	0.0315		
Sundry supplies . . . . .	0.0097	{ 0.036 quicksilver 0.0042 silver plating 0.0003 miscellaneous	{ 0.0059 silver plating 0.0018 lumber
Total . . . . .	\$0.2425	\$0.02455	\$0.0141

Power at \$30 per h. p. year; quicksilver at 50c. per lb.; castings, 2½c. per lb.; mill labor, \$2.97 per 8-hr. shift.

#### Regrinding.

Operations at the regrinding plant offer little of interest, the practice conforming closely to the usual methods.

The feed to the tube mills is already so fine (only 25 per cent. remains on a 50-mesh screen) that the efficiency of the mills is low. The critical size of sand delivered to the sand plants is about 100 mesh for unoxidized ore, and 80 mesh for oxidized ore. It is advantageous to operate the mills in closed circuit, but it is difficult to do this without permitting sulphide particles which have been sufficiently reduced in size, to remain in the circuit. By introducing a double baffle or trough classifier, containing a hydraulic device, into the slime-overflow end of a Dorr classifier this difficulty has been in a measure overcome, and two of the mills are at present using this system.

#### Sand Treatment.

The sand is leached with cyanide solution in vats 44 ft. in diameter by 9 ft. deep, holding 610 tons of sand each. The operations are distinguished by unusual care in the preparation of the material for extraction, rather than in the extraction itself.

Classification and aeration are the two essentials to successful work. The latter, necessary to overcome the tendency of the ferrous compounds in the ore to

remove the vital oxygen from the solutions, is achieved by forcing, at intervals, air under slight pressure into the false bottom, below the filter canvas. The sand charge is suitably drained before this air is applied; the pressure is so adjusted that the air is forced into the charge, yet is so low that the column of sand is nowhere broken or disturbed. To secure this immunity thorough classification is essential, and this has always been recognized as a matter of first importance.

Four batteries of cones, each fed from the discharge of the preceding set, the first three sets acting by gravity alone, the last assisted by a hydraulic connection, deliver a very clean sand to the vats. As a further precaution, the vat is filled with water before sand is turned into it, so that a constant overflow is maintained during filling and a final separation of slime particles added to the sum of the cone separations. As a matter of fact, the sand is so clean when it enters the vat that this final step is not one of strict necessity, but we have found that a charge filled in this manner is in a less compacted condition, presumably easier to leach and certainly easier to discharge.

**The action of the air** is interesting. Laboratory tests indicate that, on an average, about 75 cu. ft. of oxygen is absorbed by a ton of ore, before its reducing action is corrected. If this air is not supplied from some extraneous source, the solutions are vitiated and extraction ceases. When air is applied and is followed by a water wash, calcium thiosulphate appears in the effluent solutions; when the air is followed by cyanide, the effluents contain sulphocyanides and free cyanide appears only after some time. After a limited time of leaching, the extractive power of the solution decreases and further aeration of the charge is necessary. Each aeration is attended by the formation of some acid and the consequent destruction of some lime and cyanide. After treatment, the sand shows no sign of oxidation; neither analytical nor microscopic examination can detect differences between charge and residue.

**Lime**, crushed in a one-stamp mill to pass a 7-mesh screen, is added to the pulp stream as it flows to the vat. Regulation is by weighing a prescribed amount of lime into the automatic stamp feeder at 2-hr. intervals. The choice of screen is determined by the rate at which the lime slakes, the intent being to exhaust the particles only when treatment is completed. Formerly small quantities of lime were added to the top of charges during the drainage periods, to supplement that fed with the sand, but this is no longer considered to be necessary and is not done except in emergencies.

It had long been recognized that a high protective alkalinity was detrimental, but until within the past two years it had been tacitly accepted that it would be impossible to dispense entirely—or practically so—with protective alkali. Eventually this was done; extractions improved and consumption of cyanide was materially reduced.

The gratifying results are in a measure due to another change in procedure, initiated at about the same time. Solutions of two strengths are used; that stronger in cyanide is used earliest in the treatment of a charge. When these solutions appear as effluents, one portion is precipitated, the other brought to full working strength by adding cyanide and thereafter returned to the extraction of another charge of sand.

This custom is by no means unusual, yet wherever it is used the procedure seems to be to maintain the stronger solution at a fixed content of cyanide and to allow the weaker to vary in strength according as the varying losses in treatment may determine. This

is wrong in principle. The critical strength is that below which the weaker solution will no longer dissolve its quota of gold, or, if dissolving it, will no longer freely yield it to precipitation. If the strength is greater than this, we may confidently expect some cyanide to be destroyed without giving compensatory service. In such circumstances, if the maximum working strength is reduced, the weaker solution will be automatically restored to the lowest economic strength; if it falls below this, a temporary increase in the maximum strength will restore it. In other words, cyanide should be added to the strong solution in accord with the determinations of strength made on the weak solutions. Thus, operating with a strong solution of variable strength and a weak solution also variable, but never far from its effective limit, it may be anticipated that little cyanide will be needlessly expended.

(To be continued.)

### FIRST AID AMONG COAL MINERS IN B. C.

The continued interest among coal miners in British Columbia in the movement to extend the instruction in "First Aid to the Injured" is demonstrated by the fact that in May and the early part of June 102 men passed examinations held under the auspices of the St. John Ambulance Association, after various classes for instruction had been conducted by duly qualified surgeon instructors. Results were as follows: Passed on Vancouver island, at Nanaimo, 22 for certificate, 1 for voucher and 4 for medallion; total 27. At Extension, 8 for certificate and 1 for voucher; total 9. At Cumberland, 3 for certificate. Passed on the mainland, at Fernie, Crowsnest Pass, 59 for certificate, 2 for voucher; 1 for medallion and 1 for label; total 63.

On May 24, a First Aid competition was held at Michel, Crowsnest Pass. Five teams entered, each of five men, including a "patient." Two prizes were offered, each being a set of five gold medals. The team captained by R. Spruston gained 97 points, that by R. Stacey 93, by Ed. Heyes 82, by J. Touhey 70 and by A. Frew 48. The discounts from a possible maximum of 100 were taken from a schedule arranged by a combined committee of the First Aid classes at Coal Creek, Fernie and Michel. The judges of the competition were District Mine Inspector G. O'Brien, of Fernie; Mr. J. Quinn, of Michel, and Mr. J. Johnson, of Coleman, Alberta. The prizes were presented to the respective winners by Mr. Thos. Russell, superintendent of the Crow's Nest Pass Coal Co.'s Michel colliery.

At a meeting of the representatives of First Aid classes of men in the employ of the Crow's Nest Pass Coal Co. at Coal Creek, Fernie, and Michel, respectively, held recently at Fernie, arrangements were made in connection with a First Aid competition to be held at Fernie on July 1. Details were considered, and after full discussion arranged. It is expected that interest in the event will be general among the miners and that competition will be keen. The company's general manager, Mr. W. R. Wilson, of Fernie, is doing all he can to induce the miners generally to take instruction in First Aid, and in this he is being actively supported by the company's superintendents and under officials. The district mine inspectors, too, are assisting all they can, while Mr. Dudley Michell, instructor in First Aid for the Provincial Department of Mines, is most assiduous in furthering this beneficent work.

### BURNSIDE GOLD MINES.

In the Assize Court at the Toronto City Hall, before Mr. Justice Sutherland, Charles E. Henrotin, a mining engineer, is suing C. A. Foster, Henry Cecil and the Burnside Gold Mining Company, of Kirkland Lake, Ontario, for \$150,000, being seven and one-half per cent. of the stock of the company. Henrotin said that this arrangement was made when he guaranteed to turn over options on the property to the company. As an alternative, the plaintiff says he will take 30,000 shares of the company's stock. In a counterclaim the mining company is suing Henrotin for \$50,000 damages. The Burnside Company was floated in England last year, with a capital of \$2,000,000.

C. E. Laurie, the first witness to-day, a mining engineer of thirty years' experience, had made an examination of the Burnside Mines. A valuable vein was shown on the property adjoining. The witness believed that it dipped into the Burnside property. Having regard to the capitalization of the company, he thought that the Burnside claims were valuable. Mr. Henrotin was the best man to arrange for the purchase of the Burnside property, because he was a member of the same college fraternity as Mr. Burnside.

He told of an agreement whereby Mr. C. A. O'Connell, manager of the Tough-Oakes mine, adjoining the Burnside, was to become interested with Henrotin and himself in the latter mine. While it was not openly spoken of it was tacitly understood that by letting O'Connell in on the deal the "Anderson interests" would also become identified with the Burnside property.

"What did Mr. O'Connell do that you should make this agreement?" asked Mr. W. N. Tilley. "Up to this time he had only thrown us over the Tough-Oakes property."

"Do you still think this arrangement a good one?" "Yes."

At the subsequent formation of the Burnside Gold Mining Company \$1,000,000 was to be set aside as promoters' stock. It was understood that \$500,000 of the capital stock was to be held as treasury stock. Mr. Laurie, who said he had had experience in forming these companies thought it was most important to have a substantial block of treasury stock on hand. The plaintiff was to receive 7½ per cent. of the stock, and of this amount 22½ per cent. was to be turned over to Mr. O'Connell.

While in England, the witness offered Mr. Foster his interest in the options on the property for \$25,000.

"When I left England he expressed a desire to secure my interest, but there was no culmination," said Mr. Laurie.

The chairman of the board of directors, Mr. Simpson, who was examined, in London, England, estimated the company lost up to \$250,000 by the action of Henrotin in filing a caution against the mine. This was responsible for them not being able to carry on their work fully.

C. A. Foster, one of the defendants, was the last witness examined before adjournment. He said he had been engaged in mining operations for thirteen years. In 1912 and 1913 he was interested in the Tough-Oakes mines.

"Mr. Henrotin came to see me at the mine and said he wanted to make some money," said Foster. "He said he had some gentlemen from Toronto who were interested in mining development. He mentioned the name of Mr. Massey. I asked him how much money

they could put up and he said \$10,000. I told him I would look around and see what I could get."

"A week later Mr. Henrotin returned to the mine with Cecil and Laurie," continued the witness. "Cecil wanted to know if he could see any showing from the Tough-Oakes. He said if it impressed him favorably, he would like an opportunity of buying something for people in England. I told him that none of the properties I was interested in were for sale. I told him it would be good business for him to secure the Burnside property. He said he would send Henrotin and Laurie to Haileybury to get options. Cecil said he would pay a reasonable commission to them after the work was finished.

"Henrotin said he could get the options, except a one-quarter interest. I told him there would be no difficulty as the owners of that quarter were personal friends of mine. I made an arrangement with the owners, Anderson and Duncan, of Haileybury, to give Cecil the interest for \$50,000. As an alternative he could secure one-eighth for \$25,000 with the remaining eighth in my name. Mr. Cecil accepted this offer."—Toronto Star.

### BUTTE MINERS QUIT FEDERATION.

Alleging that in the twenty years of its affiliation with the Western Federation of Miners it had contributed \$1,000,000 to the federation, for which it had not received one cent's worth of benefit, and hinting at irregularities in the handling of strike funds by federation officers, the Butte Miners' Union, the parent organization of the Western Federation of Miners has formally withdrawn from the federation, repudiated the contract which existed between the two organizations and ordered its charter returned to federation headquarters at Denver.

The action is the outcome of friction between the Butte Miners' Union and the Western Federation, which culminated a year ago in the dynamiting here of federation headquarters.

### MICHIGAN COLLEGE OF MINES.

The Michigan College of Mines board of control re-organized last month, following the recent re-appointment of William Kelly, of Vulcan, and James MacNaughton, of Calumet, as members.

Following the meeting Dr. McNair gave out the following changes in the faculty, which were approved by the board:

Prof. E. D. Grant, promoted from assistant professor of physics and mathematics to be associate professor in the same department.

C. E. Rood named assistant professor of physics and mathematics.

Resignation of Prof. John D. Black, in charge of the department of technical writing.

Arthur D. DeFoe, now instructor in engineering English at the University of Michigan, to take charge of the technical writing and language department, including the new course in Spanish.

At the annual meeting of the Calumet & Hecla Mining Co., Geo. A. Flagg, secretary and treasurer, was elected a director to succeed Quincy A. Shaw.

Vice-president R. L. Agassiz stated that since January 1st the company has purchased and placed in its sinking fund \$920,000 of the 4 per cent. ten-year notes.

## PERSONAL AND GENERAL

Mr. Samuel W. Cohen has returned to Cobalt from a three months' trip to Nicaragua where he was engaged in the examination of gold mines under option to the Crown Reserve Mining Company, Limited. Assisting Mr. Cohen in the examination were Mr. E. L. Steindler, Mr. A. Burnett, Mr. H. Bischoff and Mr. G. Miller.

Mr. Chas. E. Henrotin is suing Messrs. C. A. Foster and Henry Cecil and the Burnside Gold Mines, Ltd., for \$150,000 for his option on the Burnside property at Kirkland Lake, Ont.

Mr. Stewart Thorne, of Cobalt, is recovering from an operation for appendicitis.

Mr. H. G. S. Anderson was in Denver, Colorado, lately, on his way to Nevada. Since leaving Cobalt, Mr. Anderson has been in Mexico.

Mr. H. Foster Bain, now editor of "The Mining Magazine," London, has been elected a member of the Institution of Mining and Metallurgy.

Mr. W. M. Brewer, of Victoria, B.C., has left that city on another trip of investigation into conditions in mining districts of British Columbia, under instructions from the Department of Mines of that province.

Mr. Henry Clark, Canadian representative of Head, Wrightson & Company, has returned to Victoria, B.C., from a trip to Australia and New Zealand. On his way back he paid a short visit to California.

Mr. F. Satchell Clarke, of Vancouver, B.C., was in San Francisco, California, in the early part of last month.

Mr. James Cronin, of Spokane, Washington, is again in the Babine section of Omineca mining division, British Columbia, where he is continuing development work on mineral claims he has held for several years.

Dr. Chas. W. Drysdale, of the Geological Survey of Canada, left Lillooet, B.C., with his party on June 13th for Bridge River, in which part of Lillooet district they will be occupied during the field season, obtaining data for a geological map and in examining the local ore deposits.

Mr. S. Duncan Ellis, who on leaving Toronto University went to the Braden copper mines in Chili and who last February joined the Artist Rifle Corps, in London, England, in the course of a letter written on May 22nd to his mother in Victoria, B.C., observed: "The mills of the gods are turbines compared to army red tape."

Mr. H. W. Hardinge, of the Hardinge Conical Mill Co., New York, has been in the Northwest for several weeks. He was at Juneau, Alaska, about the beginning of June.

Mr. Robert Keffer, son of Mr. Frederic Keffer, now with the Stewart Mining Company in the Coeur d'Alene district, Idaho, in collaboration with his college professor, Mr. Francis A. Thomson, of Pullman, Washington, contributed to the June number of Metallurgical and Chemical Engineering, New York, an article on "The Relative Efficiency of Various Amalgams in the Recovery of Gold."

Mr. W. H. Lanagan, mining engineer, of San Francisco, California, was in British Columbia last month.

Mr. A. W. McCune, Sen., of Salt Lake City, Utah, was recently in Ainsworth and Slocan mining divisions of British Columbia, arranging for having done further development work on several mining properties there in which he is largely interested.

Mr. R. G. Mellin, formerly with the Tye Copper Company has organized a syndicate to lease and develop the East Sooke copper property, on which is one of the most promising copper-ore deposits yet found in the southern part of Vancouver Island, B.C.

Mr. Dudley Michell, of the British Columbia Department of Mines, whose especial work it is to arrange for holding among miners classes for instruction in First Aid to the Injured and to assist in familiarizing them with the use of the pulmotor, is in the Crowsnest district of the province, whence he will proceed to Rossland in July to attend the twentieth general meeting of the Western Branch of the Canadian Mining Institute, the programme for which will include a demonstration of First Aid Work by Rossland miners.

Mr. Louis Pratt, well known in Slocan district of British Columbia, where for years he was in charge of a silver-lead mine, and later connected with various mining enterprises of Mr. Patrick Burns and associates, has for some time been in France, where he has been successful in securing for the firm of P. Burns & Co., of Calgary, Alberta, orders for comparatively large quantities of supplies for army uses.

Mr. Robert W. Service, best known as the poet of the Yukon, author of "Songs of a Sourdough" and other collections of poems, is stated to have left London about the end of May as a chauffeur in the Anglo-American Ambulance Corps, an organization under the auspices of the Red Cross, among the members of which are many Harvard men, some of them well-to-do men who are driving their own motor cars in their endeavors to assist in the humane work the corps is engaged in.

Mr. Bradley Stoughton, secretary of the American Institute of Mining Engineers, has returned to New York City from a visit to some of the mining centres of the Western States.

Mr. Francis A. Thomson, head of the department of mining engineering at the State College of Washington, Pullman, Washington, with a small party of his senior students, has been visiting mines and smelting works at Rossland and Trail in West Kootenay, and in the Boundary district, also in British Columbia.

Mr. John Vallance, for a number of years superintendent of the Standard silver-lead mine, near Silverton, Slocan Lake, B.C., recently paid a visit to his home at New Denver, in the same district. Since leaving the Slocan two or three years ago, he has been in mercantile business at Twodot, Montana, where with one of his sons he is successfully established.

Mr. R. A. Bryce was in Toronto last week. After a visit to Cobalt he will go to British Columbia to examine properties there.

M. Beatty & Sons, Ltd., Welland, have been successful in getting an order from the War Purchasing Commission for five carloads of material handling machinery, made up of hoisting engines, derrick irons, turntables, centrifugal pumps and clamshell buckets. This will be used by the Overseas Construction Corps in Europe. The order was received on Saturday, May 29th, and goods went forward, knocked down and packed for ocean shipment, on Tuesday, June 1st.

On and after June 15th, the Boston office of the Sullivan Machinery Company will be situated at No. 185 Devonshire Street, Room 1010 Unity Building, instead of at 35 Federal Street.

Mr. J. C. Murray was in Toronto last week.

Mr. Roscoe Wheeler, superintendent of the Hedley Gold Mining Company's 40-stamp mill and cyanide plant at Hedley, Similkameen, was in Victoria, B.C., during two days of last month.

Mr. W. R. Wilson, general manager for the Crow's Nest Pass Coal Company, was in St. Paul, Minnesota, when trouble arose in connection with the refusal of British and other miners to continue working with alien-enemy miners, and had to make a hasty return to Fernie, B.C., to direct the company's affairs until this unlooked-for difficulty was successfully overcome.

The Keuffel & Esser Company have issued a circular descriptive of a Surveyor's Duplex Slide Rule, recently placed on the market.

Mr. George L. Carter, president of the Carter Coal Company, Coalwood, W. Va., awarded a contract on May 1st to the Roberts and Schaefer Company, engineers and contractors, Chicago, for the complete designing and building of a large steel "Marcus" patent coal tippie, complete with screening and picking facilities and three "Rand" shaking loading booms, for installation at the large shaft mine recently sunk on the property of this company at Coalwood, W. Va. Price, \$60,000. This is one of the most important contracts that has been awarded for some time in the West Virginia field.

Manufacturers estimated that the 400 locomotives recently ordered by Russia will require 3,200,000 lbs. copper and 40,000 tons steel. The unusual quantity of copper is said to be due to specifications requiring that metal for fire boxes.

Among mines in British Columbia that lately resumed shipment of ore, though only on a small scale, are the Monarch, in Northeast Kootenay; Silver Hoard, in Ainsworth camp; Sally, near Beavertell, on the Kettle Valley railway west from Midway; and Iron Mask, near Kamloops, in Yale district.

A news dispatch from Butte, Montana, gives the following information: "The Stewart Mining Company is now earning \$70,000 to \$80,000 a month, and is pushing development work on its new property on Vancouver Island, British Columbia, which is being opened by a water-level tunnel." The earnings mentioned are from the operation of the company's mine in the Coeur d'Alene district, Idaho; commercial production has not been commenced at the Vancouver Island property referred to.

Patrick Clark, of Spokane, a well known Western mining man, died rather suddenly last month at the age of 65.

He learned his trade as a coal miner in Scotland, emigrated to the States, worked in the Hoosac tunnel, on the Comstock lode, sank the first shaft on the Anaconda and discovered it was a copper and not a silver mine.

He built the first plant for milling the galena ores of the Coeur d'Alene and discovered and at one time owned the famous War Eagle mine at Rossland.

Two large chests of gold bullion from Dawson and Fairbanks and 50 tons of gold concentrates from the Alaska-Gastineau mine at Thane, reached Seattle, Wash., on June 8th by the steamship Mariposa, from Alaskan ports. This gold was the first received at Seattle from the Alaska mines this season.

## B. C. COPPER.

On Monday, June 14, a commencement was made to prepare the British Columbia Copper Co.'s smeltery at Greenwood, Boundary district, B.C., for resuming smelting. One of the 800-ton blast furnaces is to be operated for a while, and the intention is to blow in the two other furnaces when a sufficiently large supply of ore shall be available. The work of dewatering the company's Mother Lode mine near Greenwood had previously been commenced. It has been announced by the Greenwood "Ledge" that for the time 50 men will be employed at the smeltery, a similar number at the Mother Lode mine, and 30 at the company's Lone Star mine, situated about ten miles from Greenwood, immediately south of the International Boundary line. Mr. F. S. Norcross, Jr., is general superintendent of the company's several mines; Mr. P. E. Crane is superintendent at the Mother Lode; Mr. F. J. Longworth is to resume the post he some time ago held, as assistant superintendent of the smeltery. Mr. Oscar Lachmund remains general manager, with headquarters at Greenwood.

A press dispatch from Fairbanks, Alaska, dated May 24th, stated that gold bullion valued at approximately \$250,000 had been shipped over the trail to Chitina and outside during the previous two weeks by the Wells Fargo Express Company, and was then on its way to San Francisco. This was the earliest shipment of gold made from the interior for years.

## THE SEA IS HIS

R. E. Vernede, in "London Evening Star."

The Sea is His: He made it,  
Black gulf and sunlit shoal  
From barriered bight to where the long  
Leagues of Atlantic roll;  
Small strait and ceaseless ocean  
He bade each one to be,  
The Sea is His: He made it—  
And England keeps it free.

By pain and stress and striving  
Beyond the nation's ken,  
By vigils stern when others slept,  
By many lives of men;  
Through nights of storm, through dawns  
Blacker than midnights be—  
This Sea that God created,  
England has kept it free.

Count me the splendid captains  
Who sailed with courage high  
To chart the perilous ways unknown—  
Tell me where these men lie!  
Tell me a path for ships to come  
They moored at Dead Man's Quay;  
The Sea is God's: He made it—  
And these men kept it free.

O little land of England,  
O mother of hearts too brave,  
Men say this trust shall pass from thee  
Who guardest Nelson's grave.  
Ay, but these braggarts yet shall learn  
Who'd hold the world in fee,  
The Sea is God's—and England,  
England shall keep it free.

## SPECIAL CORRESPONDENCE

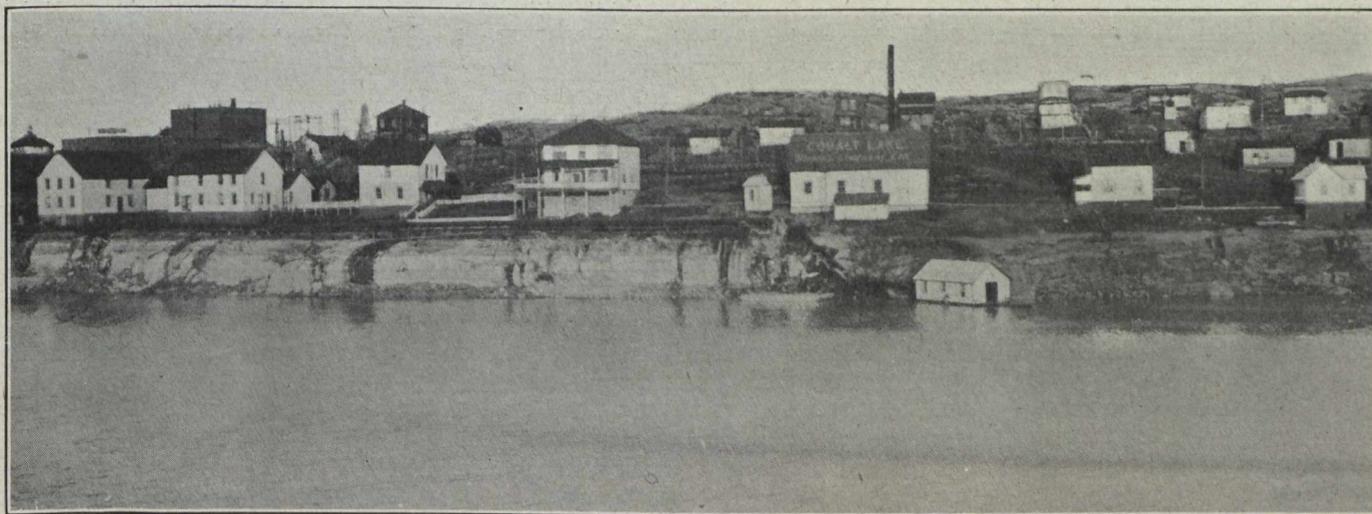
### NEW YORK

"War" continues the big topic of conversation in financial circles. Regarding what the United States could do in a world war, the general opinion is much as E. S. Martin expressed it in an editorial in "Life," namely, that "anyone knows who knows anything," that in a world war the United States, with her immense resources, her one hundred million population, and the traditional adventuresomeness of her young men, would be a factor of tremendous importance.

The extraordinary prices now existing in the metal market are coming in for much comment. Particularly copper, zinc, and lead have soared so high that the price of copper is 50 per cent. over the average of 1914; zinc has advanced nearly 400 per cent. in a few months, while lead, although lagging, has nearly doubled in a week or two. Mining companies, which had given up all hope of ever making any profits, are reaping rich gains daily; yet mining men are taking

Considerable interest has been expressed at this time in the Chinese Commission now visiting the United States, and it is noted that several of the Commissioners are mining men in China. As lately remarked in the "Mining and Scientific Press," in spite of Japan's machinations the Chinese possess a racial entity as strong and resistant as the Hebrews which will tend to offset the island empire's interference in the big Oriental country.

It is computed that Bethlehem Steel Co. can put iron ore from its new mines in Chile, at the furnaces in South Bethlehem, Penn., for slightly less than what it pays for lake ores there, since the company has to buy the latter and pay mining companies a profit, in addition to rail transportation of \$1.45 from lower lake ports to Eastern Pennsylvania. It is not expected that the Bethlehem Co. can get Chilean ores to its furnaces any cheaper than lake ores are put down at Pittsburg, in Western Pennsylvania, by steel companies operating their own mines. Bethlehem Steel also



Cobalt Lake, Opposite T. & N. O. Depot. Showing Pump House and Pipe Line Used in Dewatering.

the situation very conservatively, and few count on it to last.

The "World's Work," a comprehensive monthly, directed editorially by Ambassador Page, of London, has estimated that so enormous is the consumption of ammunition on the battlefields of Europe that the American factories are contributing less than one per cent.

Greene-Cananea, the big Sonora copper mine and smelter in which many Lake Superior people are interested, is to resume after a shut-down of months, occasioned by warring conditions in Mexico. The State Department arranged for its re-opening with Carranza.

Ingersoll-Rand Co., well known to mining men, is turning out 1,000 shells a day at its Phillipsburg, New Jersey, plant.

Much praise has been expressed, both in the United States and France for Charles M. Schwab, who owns Bethlehem Steel Co., that is so busy making war munitions for the Allies. He refused an offer of \$100,000,000 from German interests for the sale of his company, and offered to turn over the entire plant to France, merely because he likes France and dislikes Germany.

secures ore from Northern New York State, Sweden and Cuba. Ocean freight of \$2.00 per ton and Panama Canal tolls of \$1.00 per ton on Chilean ores will eat up money.

### PORCUPINE AND KIRKLAND LAKE

**Hollinger.**—There is considerable drop in the grade of Hollinger ore for the four weeks ending May 20. For the period the ore only ran 9.56 a ton against a previous minimum of about \$11.00. Mr. Robins explains this position as due to the necessity of curtailing production in order to rush development, as development has been very much hindered by the power shortage in April, and as a result much of the ore treated came from development during the last period. The report shows that of the total of 23,736 tons of ore hoisted, 5,674 tons was from development and 18,062 tons from stopes. The greatest activity was on the 200 and 300-ft. levels. All the ore below the main or 425-ft. level came from development with the exception of but 5 tons. The mill ran 93.5 per cent. of the possible running time, treating 34,112 tons, of

which 23,821 tons was Hollinger ore and 10,971 tons from Acme Gold Mines. Only 30 stamps are being used to crush Acme ore, the other 70 being reserved for the Hollinger. Total costs were a few cents above \$3.50, of which milling costs amounted to \$1.047 per ton and mining costs \$1.786 per ton. The gross profits for the period amounted to \$139,187. This was produced by a cost of \$84,662.00, of which \$42,537 was for mining and \$24,936 for milling. The surplus stands at \$1,264,093. The financial statement shows that the expenditure for plant additions for this year amounts to \$187,112. It is stated on good authority that there is no immediate intention of building a separate mill for the Acme; that some provision will have to be made for much larger tonnage of Acme ore is certain, but the development of this property has not yet reached the stage where it is necessary to make a decision at once.

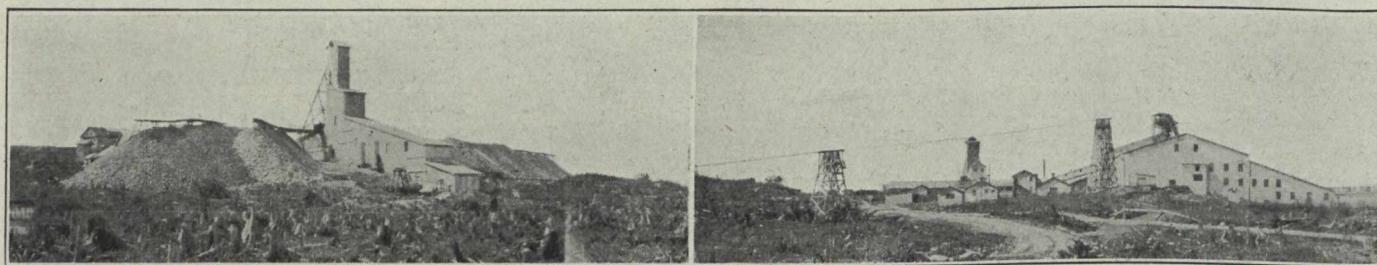
**McIntyre.**—The first visit of the new directorate of the McIntyre has been made to the mine, and as the result of the impression they received it is understood that a most aggressive policy of development is planned. It has been determined to sink a shaft at No. 5 works to the 700-ft. level without delay. It is expected that the tonnage treated at the mill in the month of June will be at least as high as any previous month since more ore is now being taken from the sections of

in such condition that it would be unwise to endeavor to sell treasury stock to finance further development. The small revenue which the company is obtaining from the sale of town lots and the rents is all that is now accruing to the company. Expenses are confined to the salary of a caretaker. The Moneta claim consists of a sandy claim adjoining the Miller Middleton. The sinking of a shaft had to be attempted through sand and by the time rock was struck a stream of water was tapped and work was abandoned.

**Dome Lake.**—Operations on the Dome Lake are confined entirely to production, no development being attempted. On the lowest scale of expenditure a good profit was made on the \$7,000 in gold bullion produced during the first half of the present month.

**Dome.**—The last monthly report of the Dome shows the largest tonnage ever crushed at the property for May; also there has not been a larger bulk of bullion produced in any one month with the exception of January, 1913, when the grade of ore ran \$8.00 in comparison with \$4.28 during the month of May. While this grade of ore is still low it is better than for many months past.

**The Kirkland Lake Gold Mine Company** will probably start up its plant at the beginning of next month. This company owns a block of claims adjoining the Teek-Hughes mine. In the shaft recently a few



Acme and Hollinger Gold Mines, Timmins, Ont.

the property where sericite is not present in large quantities.

**Wright.**—Quite a little excitement has been caused in the camp by rich ore found in the shaft on the Wright property in Deloro township. This shaft has only been put down 40 ft., but a crosscut is now being run to determine the width of the orebody, as it is certainly a good deal wider than the shaft itself. These claims are under option to the Pike Lake Gold Mining Company, by whom the work has been done under the supervision of Mr. J. B. Phillips.

**Schumacher.**—The frame work and structure of the Schumacher mill has been finished; the contractors making record time. Work on the foundation did not start until the 17th of April. All the machinery has been ordered, but nothing has been delivered as yet. Cross-cutting at the 300-ft. level towards the McIntyre boundary, a vein four and a half feet in width has been struck at a distance of 265 feet from the shaft. This vein was the first of the series got with the diamond drill some 30 feet below the 300-foot level. Stopes are rapidly being put into shape on the 100-ft. level.

**Moneta.**—The annual report of the Moneta Porcupine Gold Mines has been issued. It shows that there is in the treasury but a few thousand dollars and that there is no present intention of starting up the property. Of the 2,000,000 shares capitalization there is still in the treasury about 450,000 shares; but Sir Henry Pellatt, the president, says that the market is now

shots were put in a vein showing in the wall of the shaft, which is about 60 ft. down; the high grade ore in this vein is seven inches wide and will run \$200 to the ton. The shaft is now 80 ft. deep. It will be carried to the 150-ft. level without delay. It is expected from the dip of the known veins that cross-cutting can be conducted from this level to the most advantage.

## COBALT, GOWGANDA, SOUTH LORRAIN

**Alien Enemies.**—A very vigorous campaign has been started to intern alien enemies in the district of Timiskaming. This movement originated in the Cobalt camp and the petition has already been signed by hundreds of people. It is stated that an attempt has been made by alien enemies to blow up the Nipissing magazine and that dynamite has been stolen from various magazines for no peaceful purpose. The mining companies of the camp do not favor the idea of taking away from them many of their best muckers, but they would not actually oppose any such move. As a matter of fact many Austrians and Germans have been allowed to go within the past two months, and it has been almost impossible for them to obtain work again. There are a large number of them idle in the camp. It is felt that as these men are in very poor financial condition, the situation is not good, and all the mining companies would favor the interning of all these alien enemies who are out of work; they would also favor the registration of all alien enemies and the in-

ternment of those who have shown themselves outspoken in their espousal of the German cause.

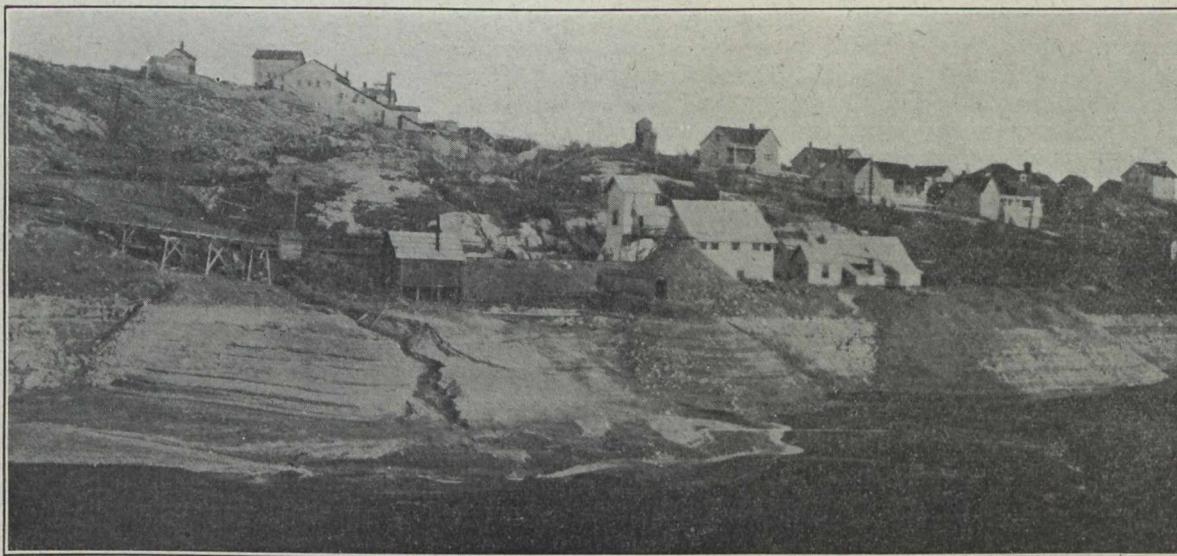
**Temiskaming.**—The situation of the Temiskaming is still one of uncertainty. To date, June 17, no contract has been signed with the power company. This is taken to indicate that the directorate had not yet given up the idea of putting in an independent plant. In the meantime the power company is allowing operations to continue at the old scale. There is little doubt that if a power plant were put in, it would be made to serve the needs of both the Temiskaming and Beaver, and it is surmised that this would be the first step towards the amalgamation of these properties. This week the Temiskaming shipped two cars of ore. Both these cars came from the mill; one of them was of low grade concentrates, the other a 30-ton car of table concentrates running about 2,000 oz. to the ton. While operations underground are confined largely to development, good results are being obtained. A new vein or the extension of an old vein has been opened on the

portation is a great difficulty. The mine lies 300 miles from the coast. Most of the journey is made by water; but there is a distance of half a day's journey on mule back.

**Silver Leaf.**—Good results are still being obtained from the Silver Leaf at the 125-ft. level. The vein is, if anything, stronger. Fifteen to twenty tons of high grade ore have already been accumulated, and a good tonnage of milling ore is also ready for concentration.

**Peterson Lake.**—Upon the Peterson Lake mine a new vein has been struck in the Keewatin formation on the old Little Nipissing. While the vein is of smaltite, and the assays are encouraging, the management does not attach very much importance to this discovery since it is entirely in the Keewatin and some distance from the contact.

**Silver Queen.**—It is learned that the Silver Queen has been leased to a syndicate of Cobalt men, and that more search for ore on this old property will be attempted. The practice of leasing is growing in the



Cobalt Lake, Showing Drained Portion Near Nipissing Mill.

400-ft. level in the old workings, and its width and grade indicate that it may be of some importance.

The **Coniagas Mining Co.** is building a trestle across Silver street in the town of Cobalt. The waste pile from the new shaft on Prospect avenue has already caused the abandonment of three or four houses on Silver street. The new trestle is being built so that the waste rock will be dumped on the other side of the street, a section where there are few houses.

**Crown Reserve.**—Mr. S. W. Cohen and some members of his party have arrived back from Nicaragua. Two members of the party are still at the Bonanza mine, where they will still continue to sample.

It is learned that the Crown Reserve Co. has not definitely decided to take up the option on the Nicaragua property. The directors believe that transportation is so difficult and the building of roads to Waterhead will entail so much money that the option price must be lowered before the proposition will be a profitable one for the company. The property has several veins approximately 30 ft. wide running about \$6.00. Only the top of these veins has been taken off by primitive methods. The mill is of simple construction and it would be necessary to install stamps before a requisite tonnage can be obtained. While there is any quantity of labor the quality is lacking. Trans-

portation is now under lease to a Haileybury Syndicate. The Right-of-Way is being worked by the company itself, but under an agreement something approaching that of a lease.

In **Gowganda** the Miller Lake-O'Brien Mining Company has started to resume work on a small basis. Since the power broke down last winter the mill has only been running for 12 hours out of the 24; now there is plenty of water to run the turbines the resumption to full power will soon be possible.

## BRITISH COLUMBIA

An unlooked-for occurrence was the stopping of work on June 8th by coal miners in the Crow's Nest country of Southeast Kootenay, consequent upon their having determined to secure the removal from the coal mines of the district of workers of the nationalities of the countries with which Great Britain and its allies are at war. Meetings were held, and strong representations were made both by officials of the United Mine Workers of America and of the Crow's Nest Pass Coal Company, but the miners remained firm in their demand. Eventually they returned to work on condition that unmarried aliens be at once excluded from the

mines and that those who have families be required to register and report to the authorities with a view to further action later on so far as these latter are concerned. In this connection it may be mentioned that, as reported in the newspapers, Superintendent Bernard Caulfield urged upon the objecting miners that the responsibility of taking the action demanded should not be placed upon the operating company, but that, rather, the Government should be appealed to with the object of having those men interned against whom this movement had been directed. He pointed out that at present the company is operating at a loss, and if the loss shall be increased by interference with the working of its mines the company may decide to close them. He submitted, further, that by keeping the aliens employed there would be much less chance of their doing harm than if they were idle. When the Crow's Nest Pass Coal Company's mines are being worked under ordinary conditions, they give employment to between 1,400 and 1,500 men at Coal Creek colliery and between 400 and 500 at Michel. Some figures published in connection with the recent trouble show the number now at Coal Creek as approximately 1,100, in the following proportions as to nationality: British, 600; Italians, Belgians and Russians, 350; Austrians, 125; and Germans, 25. It is the more important to the operators that this difficulty shall be adjusted without delay, for the chief reason that the demand for coal and coke is greater now than at any previous time since the outbreak of the European War, and with mines and smelting works getting back to working at capacity, the prospect is favorable for a continuance of improved markets for the products of the collieries.

#### West Kootenay.

**Ainsworth and Slocan.**—Generally, mining activities in these mining divisions are steadily increasing, though in most instances where work has been resumed recently operations on individual properties, apart from the Bluebell and Standard, are not important as regards the number of men for whom employment has thus been provided. However, the fact that more development work has been undertaken in various parts of the district in which nothing had been done for some time previously, is encouraging, especially as in several cases the opening of productive ore shoots is confidently expected.

**Nelson.**—In this division, too, the outlook has been improved by more work being done, both in camps within a few miles of the town of Nelson, and in the southern half of the division, about Ymir, Salmo, Sheep Creek and Erie. As yet the shipment of copper ore to smelting works has not been resumed, but several gold mines near Nelson are being worked, and it is expected that both the Silver King (silver-copper) mine and the Molly Gibson (silver-lead-zinc) mine will soon be again worked by the Consolidated Mining and Smelting Company.

**Rossland.**—The total quantity of ore from Rossland mines received at Trail during the week ended June 10th was the largest for any week since that ended March 11th of the current year. Of a total of 7,372 tons shipped early, in June, 3,680 tons was from the Consolidated Company's Centre Star-War Eagle group and 3,343 tons from its Le Roi mine, while 349 tons was from the Josie group of the Le Roi No. 2, Ltd. The total for the expired portion of the year—23 weeks—is 151,385 tons, as compared with 111,587 tons for the corresponding period of last year, an increase of 39,798 tons.

Under date of May 26th the Le Roi No. 2, Ltd., sent out from its London office the report of its Josie mine for the month of April, as received from its managers at Rossland, as follows: "Shipped to smeltery at Trail, 1,341 tons of ore and 49 tons of concentrate. Receipts were \$20,327, being payment for 1,790 tons of ore shipped, and \$1,185 for 108 tons of concentrate; sundry receipts were \$704; total receipts, \$22,216. The estimated working costs for the corresponding period were, for ore production \$8,250, milling \$550, development \$2,400, stores purchased and unused \$200, and ore tax \$1,231; total \$12,631. Balance of receipts over expenditures, \$9,587."

The same company's report for March was as follows: "Shipped to smeltery at Trail, 1,500 tons of ore and 100 tons of concentrate. Receipts were \$26,534, being payment for 1,791 tons of ore shipped, and \$489 for 97 tons of concentrate; sundry receipts were \$753; total receipts, \$27,776. The estimated working costs for the corresponding period were, for ore production \$4,750, milling \$700, development \$4,750, and stores purchased and unused \$4,625; total \$14,825. Balance of receipts over expenditures, \$12,951."

February figures were: Total receipts, \$19,655; expenditures, \$9,250; balance, \$10,405. January figures were: Total receipts, \$18,875; expenditures, \$9,375; balance, \$9,500. For the four months ended April 30th the balance of receipts over expenditures, as shown above, was \$42,441. On May 1st the company paid a dividend of one shilling a share on its 120,000 shares, total £6,000, or approximately \$30,000, out of net profits made last year.

**Ore Receipts at Trail.**—Ore receipts at the Consolidated Mining and Smelting Company's smeltery at Trail are to a considerable extent indicative of the position in East and West Kootenay districts so far as concerns production of ores of which the chief marketable constituents are silver, lead, and zinc, in those of one class, and gold, silver and copper in those of another. Gold ores, milled at or near the place of production, are not included, for only table-concentrates, usually in comparatively small quantity, are sent from gold-saving mills to smelting works; yet even the quantity of concentrates received from them for smelting may tell of the relative productive activity of the gold mines. Of course, receipts at Trail from Ainsworth and Slocan mines do not show the quantity of silver-lead and silver-zinc ores mined in those divisions, for the reason that the greater part of such ores is concentrated at local mills. Most of the lead concentrate produced is sent to Trail, but the zinc concentrate is shipped to reduction works in the United States.

The following table shows the sources and quantities of ores received at Trail during twenty-one weeks of 1915, ended May 27th, and for the corresponding period of 1914, the production in which latter time, it should be remembered, was not affected by war conditions, as was that of the current year:

	Period Ended	
	May 27, 1915.	May 28, 1914.
	Tons.	Tons.
East Kootenay .....	17,370	7,235
West Kootenay—		
Ainsworth.....	1,662	7,741
Slocan.....	1,737	8,695
Nelson.....	1,644	10,759
Rossland.....	138,203	96,275
Lardeau.....	17	.....
Boundary.....	220	130

Coast.....	101	782
Alberta.....	10	....
State of Washington (U.S.A.)	12,380	6,390
Totals.....	173,344	138,007

Of the substantial net gain of 35,337 tons made this year as compared with last, approximately 10,000 tons was from East Kootenay and 42,000 tons from Rossland—practically all from mines owned by the Consolidated Mining and Smelting Company—and 6,000 tons from the State of Washington; against these increases were decreases totalling 22,833 tons, including approximately 6,000 tons less from Ainsworth mining division (Bluebell and Consolidated Company's mines), 7,000 tons from Sloean mines (chiefly the Standard), 9,000 tons from Nelson division (in large part from the Silver King mine), and the small remainder from Coast mines. Now, however, that production has been resumed at the several mines in Ainsworth and Sloean divisions that were responsible for the decreases, the increase in output may be expected to be proportionately larger as from the beginning of June.

**Ainsworth.**—While production from this mining division in May was restricted to only two mines—the No. 1 which shipped 497 tons and the Early Bird 21 tons—there was progress at other properties. Mention has been made of a resumption of work at the New Canadian Metal Co.'s Bluebell, at which the concentrating plant as well as the mine will be in operation shortly. Other mines of the Consolidated Mining and Smelting Co., which owns the No. 1, are the Highland and the Banker-Maestro, both in the neighborhood of the town of Ainsworth and both expected to soon be again on the shipping list. The Florence Co.'s mine is reported to be developing satisfactorily with ore available for extraction. Little is heard of the Silver Hoard, but much development work has been done, power equipment put in, and preparations made for maintaining an output of ore as soon as conditions shall be favorable for doing this. Work is again being done on several properties on Woodberry creek, near Ainsworth. West of Kaslo, encouraging progress is reported from the Cork-Province group on the south fork of Kaslo creek, where, so the Kootenaiian has been informed, a shoot of galena ore of shipping grade has been found in an extension into the Cork claim of an old adit driven years ago in the Province ground. Encouraging accounts have also been received from the Utica mine, on Paddy mountain, where the occurrence of more silver in some parts of the orebody than has been general is claimed. Arrangements are stated to have been made for continuing work on Rettalack & Co.'s Whitewater group, and there are other claims in that part of Ainsworth division on which development is also being done. As soon as the trail is hard enough, a pack-train will bring the silver ore mined at the Panama during the winter down from that mine in the mountains to the railway for shipment to the smeltery at Trail.

**Sloean.**—In the eastern part of this division, the Lucky Jim zinc-lead mine is again having development work done in it, the sanction of the court to its being given another chance to stave off threatened foreclosure by the mortgagee having been obtained. The sum of \$5,000 has been deposited with the court and work is now being done under the direction of Mr. A. G. Larson, who, several years ago, was superintendent of the Le Roi mine, in Rossland camp. Shipment of zinc concentrate made at the Ivanhoe mill, Sandon, from ore from the Surprise mine, is stated to have been

checked until such time as the smeltery in the United States to which that product was being shipped shall be prepared to again take it. The Sloean Star is being operated, and the Ruth concentrating mill should soon be running again after having been overhauled. Other properties around Sandon or Cody are having attention. Silverton camp, the Silverton Mines, Ltd., continues to operate its concentrating plant on Four-mile creek treating ore from its Hewitt-Lorna Doone mines, and development is being done as well on several smaller properties in the camp. The Standard Silver-Lead Mining Co. has put on one shift to run its concentrator at Silverton, and gradually mining operations are being extended in its group of mines which includes the Emily Edith, Standard, and Alpha properties. Lower down Sloean lake, in Sloean City mining division, the Enterprise is again being worked on lease, and other properties in the division are giving employment to a few men, but there has not been much ore produced this year from mines in this part of the Sloean district.

#### General Notes.

News from Boundary district gives the information that the Granby Company is working at ordinary full capacity of mines and smeltery and that all its employees are receiving increased wages; also that the Argo, E. P. U., Marjorie, Prince Henry, Skylark, and other small properties in Greenwood division, are being worked, each employing a few men. The Jewel gold-mine and stamp mill are being operated as usual. There is more being done in Franklin camp, north of Grand Forks, than in the early spring, and promising developments have been reported from that part of the district.

The latest list of ore receipts at Trail includes small shipments from the Iron Mask mine, near Kamloops, and the Monarch, near Field, the former of 72 tons and the latter of 33 tons. Both had been off the smeltery shipping list for some time.

In the Coast district, a discovery has been reported of molybdenite ore within a few miles of the head of Stave Lake and about seventy miles from the City of Vancouver. A story has been published in Vancouver of a local syndicate having opened on Pitt Lake, nearer that city than the molybdenite find, a property on which it is alleged "there are veins of copper from four to five feet wide showing values of from 25 to 30 per cent." but this is most likely a "fairy tale," for some pleasant fiction concerning alleged mineral discoveries is not infrequently indulged in by newspaper men, or their misinformants, in that city.

#### NIPISSING MINES CO.

Nipissing Mines Co. has a cash surplus of \$1,400,000, the largest by \$78,000 for more than a year. This financial position has been attained notwithstanding the rather unsatisfactory silver market. Forty-nine-cent silver was the basis used in determining the current status of Nipissing's treasury. It is understood that the company has not been selling all its product, preferring to await higher prices.

Financial statement as of June 21 shows Nipissing Mines Co. cash, \$610,829; ore including that on hand and ready for shipment, \$791,243; total, \$1,402,072.

Nipissing Mines Co. declared regular quarterly dividend of 5 per cent., payable July 20, to stock of record June 30.

## THE ECONOMICAL USE OF COAL

Mr. Alexander Sharp has sent the following to the editor of the Daily Province, Vancouver. It refers particularly to the Vancouver district, but will prove interesting to many not resident there.

The increasing use of imported crude oil for fuel is having a very serious effect on the coal mining industry of British Columbia. As a result those interested in the business of coal mining are urging the Federal Government to put a tariff on imported fuel oil. On the other hand, the manufacturing interests, besides railway and steamship transportation companies operating in British Columbia, ask the Government not to impose a duty on crude oil.

I do not propose here to say anything for or against the imposing of a duty on crude oil, but rather to point out that when coal is properly assorted and manufactured, crude oil is not such a formidable competitor of coal as it is supposed to be, especially when oil is shipped from a distance, into a coal mining country.

Some few years ago, when oil was "struck" in large quantities in the State of Pennsylvania and other eastern states, it replaced coal for steam production to a great extent. In addition coal had to contend with the competition of gas from the natural gas wells, and electricity produced by water power. It was believed the days of "old King Coal" were gone forever. Coal mining stock fell to zero. In England oil fuel was also being largely used to the detriment of the coal trade.

The coal interests, of course, did not look for a tariff to be put on oil produced within their own states. In free trade England a tariff was out of the question. It was, therefore, up to the coal companies, with the assistance of the state, to work out their own salvation, and re-establish coal on the market as the cheapest, most lasting and safest of fuels.

Prior to the introduction of oil fuel, in the countries referred to, coal on reaching the surface from the mine was tumbled like debris into cars, etc., with scant ceremony, and supplied to the consumer practically as it left its natural bed. Except that some of the slack or dross coal would be screened from it, and an occasional piece of rock or slate picked out from among the coal. As a consequence the consumer was not infrequently supplied with coal containing from 20 to 25 per cent. ash. Under these circumstances, it was not a difficult matter for oil to replace coal, as a fuel, for manufacturing, railway and steamship transportation purposes.

Oil competition, however, sharpened the business wits of the coal operators, with the result that coal is no longer put on the market containing a large percentage of dust and foreign matter. It is freed of all debris, assorted into various sizing, such as lumps, eggs, walnuts, beans, peas and fines, suitable to the requirements of the consumer, that it may yield the greatest amount of heat units per ton of coal purchased. Fine coal which would often amount to as much as from 10 per cent. to 25 per cent. of the total quantity of coal mined, was either left in the mine, or dumped on the surface as waste. Now it is manufactured into briquetted fuel, bringing the highest fuel price on the market, adding to the profits of the coal operators and to the wealth of the nation.

It can be very readily understood that coal so cleaned, assorted and manufactured, has no trouble in dominating the fuel markets of the United States. According to the most recent report issued by the Bureau of

Census on "Fuel Used for Manufacturing in U. S. A.," oil, including gasoline, only amounts to 3.44 per cent. of the total fuel used, Bituminous coal 76.93 per cent., anthracite coal 7.74 per cent., coke 10.43 per cent., wood 1.45 per cent., gas 0.01 per cent.

It would appear that oil fuel has replaced coal in British Columbia to the extent of 700,000 tons of coal annually. A few years ago oil was imported to the extent of only 5,000,000 gallons, now it is shipped in to the amount of 110,000,000 gallons per year. This no doubt was largely brought about by the unfortunate Vancouver Island strike and the unprepared condition in which some coal was supplied to the consumer two or three years ago, especially during the winter months, when the demand would be greater than the supply. The strike has passed away, and the quality of coal at present on the market is much improved, and if it continues to do so, the 110,000,000 gallons of oil now being used largely as a fuel will in time be reduced to a minimum. The coal operators of British Columbia have the matter very much in their own hands, as the operators had in Pennsylvania.

When we read how greatly the coal trade at the Cumberland mines has been adversely affected by the importation of oil fuel into the province, we wonder how it comes about that the iron works of Vancouver require to ship foundry coke from Pennsylvania, and the Granby Smelter Co. need to ship from Fernie and the State of Washington for their smelter at Granby Bay. The Cumberland mine coal, when cleaned and washed, can be manufactured into an excellent coke for all purposes, free of sulphur.

Under the present conditions of the coal trade, it appears anomalous that our iron works and smelters require to import coke and that the conservation commission should prohibit the use of coal being used on the railway locomotives within the province. The mining industry want fair play, and less of such restrictive and immatured legislative action.

In many parts of Europe and the United States coal is coming "to its own." Producer gas and by-products recovery plants are being operated with great success. It requires no prophetic eye to see that the day has all but arrived when the coal owners of British Columbia will derive their largest revenue from the by-products of the coal, and as a consequence the public will be supplied with a cheaper coal.

The Mond process, used largely abroad, yields from 80 to 90 lb. of sulphate of ammonia per ton of coal, in addition to the tar and gas from ordinary coal. Sulphate of ammonia is worth from \$60 to \$80 per ton, and the gas from these producers is being used in gas engines, iron melting, radiators, tube welding, indeed in every kind of manufacturing industrial works. The average price at which the gas was sold in 1912 (in a large manufacturing district in England) was 3.5 cents per 1,000 cubic feet.

In western Canada the by-product industry has developed less than in any other coal country. Indeed, it is negligible.

In many coal districts by-product coke ovens are being used in the making of coke for metallurgical purposes, and the by-products of coal gas, tar, ammonia, benzol, etc., collected and turned into money. In Western Canada, the old class of bee-hive coke ovens are still in general use, with the result that valuable by-products of the coal are lost.

Dr. Frank Adams, in an address before the Canadian Mining Institute, Toronto, March 4, 1915, in speaking on this subject said: "In the year 1912 405,457 tons

of coke were made in bee-hive ovens in Alberta and British Columbia, representing a waste of approximately 12,569,899 lb. of ammonium sulphate, and 43,383,899 gallons of tar, not to mention the benzol and other minor products, and the immense amount of gas."

There is no coal in the world richer in by-products than the coal of British Columbia, the fines that has hitherto been looked upon as waste at some of our coal mines, if properly cleaned and made into briquettes, mixed with a suitable binder, would produce a fuel having a calorific power equal to the best imported anthracite coal. The Germans use briquettes in their torpedo boats.

The sulphate of ammonia obtained from coal is generally in proportion to the nitrogen contents. The average nitrogen in our coal is about 1.4 per cent., which is equal to 85 lb. of ammonia to the ton of coal.

According to chemical analysis, the richest by-product coal in Canada is the coal of the Nicola Valley Coal and Coke Co., Limited, Merritt, which contains 2 per cent. nitrogen, besides the tar and gas.

It is probable that the future of this valuable coal area may lie in the extraction of this sulphate of ammonia, gas, oils, etc. (in addition to its being used as a fuel), and the gas piped down to Vancouver and the Fraser River valley. It is being done elsewhere and why not in British Columbia?

The South Staffordshire Mond Gas Company furnishes the public with such a producer gas. The charter granted them by Parliament grants them the right to supply gas over an area of 123 square miles. In this area there are six corporations (including Wolverhampton), the gas for power purposes is used by 100 miles of railways, as many miles of canals, fully 2,000 public works. The price of gas is 5½ cents to 3½ cents per 1,000 cubic feet. At Indianapolis by-product coke-oven gas is being supplied for town use at 57 cents per 1,000 cubic feet; in other American cities at a much lower rate.

If gas from a by-product plant at Nicola Valley is ever used in Vancouver and district, the smoke from California crude oil will no longer pollute the atmosphere or the blue waters of the Inlet. The business artery of the district will throb with a fullness of industrial life. Space in our business blocks will be rented at a premium and the home filled with artisans.

#### COAL MINING IN WASHINGTON.

The report of the State Inspector of Coal Mines, State of Washington, for the biennial period ended December 31, 1914, was issued recently. The inspector, Mr. James Bagley, gives the following information in the first part of his comprehensive introduction:

"The coal production of Washington showed a marked increase in 1913 over the previous year, when 3,831,647 short tons was produced against 3,346,946 short tons for 1912, an increase of 484,701 short tons, or 14.4 per cent. The large increase in the consumption of Washington coal in 1913 was due in considerable measure to labor troubles in the coal mines on Vancouver island, in British Columbia, when a large amount of Washington coal was shipped into the market formerly supplied by the British Columbia mines. The figures for 1914 are not so encouraging, only 3,040,361 tons having been produced, showing a loss of 791,286 short tons, or about 26 per cent. decrease compared with 1913. The total quantity for the biennial period was 6,872,008 short tons as compared with 6,895,268

short tons for the previous two years, or a loss of 23,260 short tons for the biennial period. The average value of coal at the mine was \$2.60 in 1913 and \$2.35 in 1914. The total value of coal at the mine in 1913 was \$9,965,362.50, and in 1914 \$7,142,084.

"The production of coke in 1913 broke all previous records when 75,732 short tons was produced at an average value of \$5.62 short ton at the mine. The production for 1914 shows an increase over 1913, 78,573 short tons having been produced for the year. The average value at the mine decreased to \$5.15 per short ton. The total value of the coke production was \$425,632 in 1913 and \$404,126 in 1914. The coke production of the state is confined to Pierce county. Carbonado, Wilkeson and Fairfax mines are the chief producers.

"The total number of employees in the industry was 6,065 in 1913 and 5,647 in 1914, an average of 5,856 for the two years. The average for the preceding two years was 5,727.

"The statistics for the past ten years show that the coal mining industry has not advanced as rapidly as the growth of the state should warrant; in fact the production for last year is about the same as ten years ago. This condition is due to the substitution of oil for coal as fuel in many of the industries where coal formerly found a ready market. The railways in Washington, which a few years ago were using coal almost exclusively, are now using large quantities of fuel oil. Many of the steamships running out of Puget Sound and coast ports are using oil for fuel. Some of the large steamers in the freight and passenger traffic running between California and Puget Sound ports were converted from coal into oil burners during the last two years. Electricity is also replacing coal in a great many of the manufacturing plants in the Puget Sound district. The natural resources of Washington enable the power companies to generate power at a very low cost to the consumer.

"The prediction by those best informed is, that there will not be any great increase in the consumption of Washington coal while California fuel oil remains at the present price. Should the supply of California fuel oil decrease, the Washington coal mines would be worked to their full capacity."

Information relative to accidents at coal mines includes statistics showing that during 1913 and 1914 there were 39 fatal and 1,604 non-fatal accidents. The number of fatalities compares with 41 for the previous biennial period. There were not any serious labor troubles, only a few strikes of short duration at some of the mines. One hundred and forty-two men received from the U. S. Bureau of Mines certificates of competency in mine-rescue and first-aid training, and 118 took first-aid training only.

#### ALIEN ENEMIES AT COBALT.

Cobalt, June 23.

After considerable agitation from various quarters regarding the alien enemies in the camp, definite action has been taken and a lengthy petition signed by residents of Cobalt and other northern towns, and of the entire district. At a meeting of the local Board of Trade last night, it was decided to send a deputation to Ottawa, asking that a general internment of aliens be begun immediately. It is pointed out that the subjects of countries at war with Great Britain and her allies are under no apparent control in the camp and in a position to commit acts detrimental to the welfare of the country.

### U. S. COAL TRADE IN 1914.

Coal production in the United States in 1914 compares as follows in net tons:

	*1914	1913
Anthracite. . . . .	91,000,000	91,000,000
Bituminous . . . . .	420,000,000	479,000,000
Total . . . . .	510,000,000	570,000,000

\*Estimated.

Loss has thus been due in the soft coal trade to the decline of manufacturing and of the greatest of coal consuming trades, iron, steel and coke, which has heavily hurt the coal trade.

Pennsylvania coal tax of ten cents a ton remains unsettled and is being tested in the courts.

Coal production in 1913 was 570,048,125 short tons, an increase over 1912 of 35,581,545 tons, or nearly 7 per cent. Value of this coal was \$760,488,785. Per capita production was 5.85 tons.

The year was important in the renewal of the biennial agreement for wages of miners.

Anthracite trade has been marked by the steadiness which is now the characteristic of the hard coal production.

Anthracite mines have produced about 91,000,000 net tons. Of this amount about 15 per cent. is consumed for operative and local heating purposes, leaving over 70,000,000 tons for distribution. Prices have held firm and hard coal has been the backbone of a coal trade that under the pressure of extraordinary conditions might easily have yielded to untoward circumstances.

Conditions in the lake trade have been unpropitious since the start of the season. Decrease in tonnage which passes through the Soo gateway was over 525,000 tons in anthracite coal and almost 3,500,000 tons in bituminous, a total of almost 4,000,000 tons.

Decrease in dangers and in costs for the coal fleet around the northern capes by protection of the Cape Cod canal has not materialized fully as yet. Barges for coal traffic draw from 19 to 22 feet and the canal is fully prepared for only 15 feet of draft. Only three-quarters of a mile remains to be dredged in the middle of the canal to depth required for coal barging of the large size and this will help freighting of coal and reduce prices and so stimulate the coal trade within the coming and subsequent years.

Disappointment in the coal trade has been helped by the failure of export trade to develop in any way commensurately with expectations produced by the war. But there is confident feeling that the United States will soon establish large export relations and there are favorable indications of increasing purchasing of American coals.

Labor conditions have been remarkable in their freedom from difficulties. There have been two notable exceptions. The strike in Colorado has continued to the great detriment of the industries of that state and to the embittering of trade relations. This has caused a decrease of about 14 per cent. in production. In the large eastern Ohio field there has been failure to adjust differences whose actual spread is slight, but where the principles involved cause divergence which it seems impossible to compromise. Reduction of production has lent a certain strength to the situation in a year that has struggled against very adverse factors.—Boston News Bureau.

### JACKLING PROPERTIES.

Butte, Mont., June 11, 1915.

D. C. Jackling, who was in Butte to inspect the Butte & Superior mine and mill with Charles Hayden, of Boston, and other directors of the Jackling companies, in an interview, said:

"We have decided to proceed at once with the development of the Butte-New York properties. The Butte & Superior Co. owns the controlling interest in the stock of the Butte-New York Copper Co., which controls what is known as the Butte-Milwaukee group of claims. These claims lying east and north from the Black Rock will be developed as rapidly as possible. With the present price of spelter and copper we are certainly going to devote our energies to mining all that we can of both in the companies with which I am connected. One of the hardest problems the Butte & Superior Co. has had to face was that of finding a way to handle our concentrates. The smelter capacity of the country for the handling of spelter is limited, and we found this a handicap. Happily we have been able to make the needed arrangements, so that the company was not compelled to curtail to any material extent the output of the Black Rock mine and the Butte & Superior mill. We will go right ahead now with further developments of the ore reserves. The Butte-New York claims are zinc properties and we expect to keep ore reserves well ahead. The development will be carried on from our 1,200-ft. level in the Butte & Superior which runs into the Butte-New York ground and also from other levels. All of our companies are working to meet the big demand for spelter and copper that has sprung up so suddenly. At present prices they can make large profits and they are aiming to meet the demand for the metals, to their capacity. Utah Copper and all the porphyries are now running to the very limit of their capacity. They have been steadily increasing the amount of copper produced while the cost of production is now reduced to the lowest point these companies have ever known. Butte & Superior was making money when spelter was selling at five cents a lb. Now that the price of spelter is way up around 24 cents a lb., with demand for it far into the coming months, the company is making a showing that no one even dreamed would be possible six months ago.

"We will sail for Alaska on June 11, according to present plans. The new mill there is making a fine record. It has already handled 50 per cent. more ore than the supposed capacity when it was built. We are more than satisfied with the results shown there. In all our mining operations we are making efforts to meet the conditions that are arising. The war in Europe is causing situations that are unprecedented. In both spelter and copper the smelting operations are giving more concern than the mining part of it. It is not at all unlikely that additional smelting capacity will be required if conditions continue as at present. The improvements made in the line of leaching plants and many other improvements that could be mentioned are receiving greater attention than ever since copper has risen so rapidly and the demand has increased. The general mining outlook is splendid. That expresses it."

#### Casey's View.

"O'im a paccable man an' I hope that Oi may niver be anything else."

"Then you don't want war with Germany?"

"Oi do not. But, begorry, if Jarmany wants war wid us, Oi t'ink we ought to be neighborly an' accomodatit'."—Boston Transcript.

## THE KAISER HAS NO INVESTMENTS IN CANADA

The following communication from Mr. Alvo von Alvensleben, formerly extensively connected with real estate transactions and various company promotions in British Columbia, but now resident in Seattle, Washington, appeared in a recent issue of "Coal Age," published in New York City:

"My attention has been drawn to the industrial news item published in 'Coal Age,' April 24, page 742, which is evidently taken from numerous similar publications that have appeared in various newspapers on the Pacific Coast and which contained a number of mis-statements, that I have been obliged to correct in the most emphatic terms practically each time they have appeared. Notwithstanding this fact, many of the papers have persisted in referring to the story again and again, presumably because they consider it interesting reading. In doing so, they ignore the fact that such a publication of an untruth has the effect to prejudice unfairly important industrial interests both of myself and others associated in the same enterprise.

Permit me to assert briefly the following facts: His Majesty, William II., Emperor of Germany, so far as I know, has never directly or indirectly, invested one cent in Canada, either through me or anybody else. Furthermore, my associates and I have never had \$5,000,000 invested in Canadian coal fields. Our investments scarcely amount to \$1,000,000. There is no reason why these investments should be 'irretrievably lost,' inasmuch as they are in companies formed under a British Columbia charter, and the shareholders comprise Germans, Canadians, Americans and Englishmen."

The item in "Coal Age" to which Mr. von Alvensleben makes reference was as follows:

"Spokane, Wash.—The sum of five million dollars, invested in Canadian coal fields by the Count Alvo Alvensleben, of Seattle, will likely be irretrievably lost because the Count was unfortunate enough to interest Kaiser Wilhelm in his mining enterprise. The Count, too, is German, and since the war broke out, he has confined his business to this side of the line. He is the dominant figure in the Issaquah and Superior coal districts of Washington."

Incidentally, it may be mentioned, Mr. von Alvensleben appears to suggest that he is not entitled to be called "Count," which title, he says, "the press of this country has invariably insisted in conferring upon me."

It may be of interest to add that on June 1 the unopposed application for the foreclosure of an agreement to purchase a number of timber limits in British Columbia, sold by the Red Cliff Land and Lumber Company, of Duluth, to the Alvo von Alvensleben Company, was granted in Vancouver, B.C., by a Supreme Court judge. It was stated that the von Alvensleben Company had paid \$800,000 on account of the total purchase price of \$2,200,000, and that there was overdue \$100,000 on the principal, \$100,000 as interest, and \$9,000 on unpaid taxes.

Ottawa, June 12.—It is stated from an authoritative source that the Government is about to decide on the impending change in the Cabinet. The Hon. Louis Coderre is, it is said, to be appointed a judge of the Superior Court for the District of Mont Laurier, succeeding Mr. Justice Chauvin, who will be transferred to Montreal to replace the late Mr. Justice Beaudin. Mr. J. M. Tellier has been again asked to accept the portfolio of Secretary of State, which Mr. Coderre is to resign, but has not yet given his answer.

Mr. Coderre is Secretary of State and Minister of Mines.

## LIEGE.

Betwixt the Foe and France was she—  
France the immortal, France the free.  
The Foe, like one vast living sea,  
Drew nigh.

He dreamed that none his tide would stay;  
But when he bade her to make way,  
She, through her cannon, answered, "Nay,  
Not I!"

No tremor and no fear she showed:  
She held the pass, she barred the road,  
While Death's unsleeping feet bestrode  
The ground.

So long as deeds of noblest worth  
Are sung mid joy, and tears, and mirth,  
Her glory shall to the ends of Earth  
Resound.

Watched by a world that yearned to aid,  
Lonely she stood but undismayed,  
Resplendent was the part she played,  
And pure.

Praised be her heroes, proud her sons!  
She threw her souls into the guns.  
Her name shall, with the loveliest ones,  
Endure.

—William Watson.

## TWO KILLED AT KERR LAKE.

Cobalt, June 27.

A verdict of accidental death was rendered yesterday at the inquest into the death of W. S. Eldridge and W. B. Foote, who were instantly killed in a stope of the Kerr Lake mine here on Friday afternoon. They walked on to a set of loaded holes just as the charge exploded. The remains of Eldridge were shipped to relatives in Philadelphia, Silver Lodge Masons taking charge of the funeral arrangements here, and the remains of Foote were sent to his only near relative, his mother, living in Geneva, N.Y. Eldridge was the engineer of the mine, and Foote was a wealthy capitalist interested in several mining properties in Porcupine and in British Columbia. W. S. Eldridge was a popular young mining engineer, a graduate of the Michigan College of Mines.

## BOOK REVIEW.

**PRACTICAL OIL GEOLOGY**—The Application of Geology to Oil Field Problems—By Dorsey Hager—McGraw-Hill Book Co.—For sale by Book Department, Canadian Mining Journal.

The author's endeavor has been to furnish the oil man with a clear, concise and practical work on the occurrence of oil and its extraction. Most books on oil are by English authors, whose experience has been largely in Europe and Asia. This is essentially an American book.

The several chapters are headed as follows. Petroleum, its origin and physical and chemical properties; Stratigraphy; Structural Geology; Prospecting and Mapping; Locating Drill Hole Sites; Factors in Oil-well Drilling; Factors in Oil Production; Water; Cautions.

# MARKETS

## SILVER PRICES.

	New York, cents.	London, pence.
June—		
9 . . . . .	49 $\frac{5}{8}$	23 $\frac{1}{2}$
10 . . . . .	49 $\frac{1}{4}$	23 $\frac{5}{8}$
11 . . . . .	49 $\frac{3}{8}$	23 $\frac{3}{8}$
12 . . . . .	49 $\frac{3}{8}$	23 $\frac{3}{8}$
14 . . . . .	49 $\frac{1}{2}$	23 $\frac{7}{8}$
15 . . . . .	49 $\frac{1}{4}$	23 $\frac{3}{8}$
16 . . . . .	49 $\frac{1}{8}$	23 $\frac{3}{8}$
17 . . . . .	49 $\frac{1}{8}$	23 $\frac{5}{8}$
18 . . . . .	49 $\frac{1}{8}$	23 $\frac{3}{8}$
19 . . . . .	..	..
21 . . . . .	..	..
22 . . . . .	48 $\frac{7}{8}$	23 $\frac{1}{4}$

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Building,  
Toronto, Ontario.)

### New York Curb.

	Bid.	Ask.
Alaska Gold . . . . .	37.50	38.25
British Copper . . . . .	62 $\frac{1}{2}$	1.00
Braden Copper . . . . .	7.25	7.37 $\frac{1}{2}$
California Oil . . . . .	279.00	281.00
Chino Copper . . . . .	48.50	48.62 $\frac{1}{2}$
Giroux Copper . . . . .	.50	1.50
Goldfield Cons . . . . .	1.50	1.56 $\frac{1}{4}$
Green Can. . . . .	40.00	42.00
Granby . . . . .	88.50	89.00
Inspiration Copper . . . . .	31.87 $\frac{1}{2}$	32.00
International Nickel . . . . .	150.00	151.00
Miami Copper . . . . .	25.87 $\frac{1}{2}$	26.00
Nevada Copper . . . . .	14.87 $\frac{1}{2}$	15.00
Ohio Oil . . . . .	135.00	137.00
Ray Cons. Copper . . . . .	14.00	14.12 $\frac{1}{2}$
Standard Oil of New York . . . . .	185.00	187.00
Standard Oil of N. J. . . . .	401.00	403.00
Standard Oil (old) . . . . .	1350.00	..
Standard Oil (subs) . . . . .	950.00	..
Tonopah Mining . . . . .	7.00	7.12 $\frac{1}{2}$
Tonopah Belmont . . . . .	4.00	4.12 $\frac{1}{2}$
Tonopah Merger . . . . .	40.00	41.00
Yukon Gold . . . . .	2.50	2.75

### Porcupine Stocks.

	Bid.	Ask.
Apex . . . . .	.03	.03 $\frac{1}{2}$
Dome Extension . . . . .	.12 $\frac{1}{2}$	.12 $\frac{3}{4}$
Domè Lake . . . . .	.15	.15 $\frac{1}{2}$
Dome Mines . . . . .	17.00	17.25
Foley O'Brien . . . . .	.29	.32
Hollinger . . . . .	.25 $\frac{1}{2}$	.26
Jupiter . . . . .	.08 $\frac{1}{4}$	.08 $\frac{1}{2}$
McIntyre . . . . .	.40 $\frac{1}{2}$	.41
Moneta . . . . .	.05	.05 $\frac{1}{2}$
Pearl Lake . . . . .	.01 $\frac{1}{4}$	.01 $\frac{1}{2}$
Porcupine Gold . . . . .	$\frac{1}{2}$	$\frac{3}{4}$
Porcupine Imperial . . . . .	.05 $\frac{7}{8}$	.06
Porcupine Crown . . . . .	.75	.82
Porcupine Vipond . . . . .	.46 $\frac{1}{2}$	.46 $\frac{3}{4}$
Preston East Dome . . . . .	.02 $\frac{7}{8}$	.03 $\frac{1}{8}$
Rea . . . . .	.11	.13
Tisdale . . . . .	.01	.02
West Dome . . . . .	.05 $\frac{3}{8}$	.05 $\frac{1}{2}$

## Cobalt Stocks.

	Bid.	Ask.
Bailey . . . . .	.02 $\frac{3}{8}$	.02 $\frac{1}{2}$
Beaver . . . . .	.32	.33
Buffalo . . . . .	.50	.70
Chambers Ferland . . . . .	.17	.18
Coniagas . . . . .	.04 $\frac{3}{4}$	.05 $\frac{1}{4}$
Crown Reserve . . . . .	.74	.77
Foster . . . . .	.04	.05
Gifford . . . . .	.017 $\frac{1}{8}$	.02 $\frac{1}{2}$
Gould . . . . .	$\frac{1}{4}$	$\frac{5}{8}$
Great Northern . . . . .	.02 $\frac{1}{2}$	.02 $\frac{3}{4}$
Hargraves . . . . .	01 $\frac{1}{4}$	.01 $\frac{3}{4}$
Hudson Bay . . . . .	18.50	19.00
Kerr Lake . . . . .	4.50	4.75
La Rose . . . . .	.49	.52
McKinley . . . . .	.25	.26
Nipissing . . . . .	6.00	6.25
Right of Way . . . . .	..	.04
Peterson Lake . . . . .	.22 $\frac{1}{2}$	.23
Silver Leaf . . . . .	.02 $\frac{1}{2}$	.03 $\frac{1}{2}$
Teck Hughes . . . . .	.05	.05 $\frac{1}{4}$
Temiskaming . . . . .	.34 $\frac{1}{2}$	.34 $\frac{3}{4}$
Trethewey . . . . .	.09	.10 $\frac{1}{2}$
Wetlaufer . . . . .	.03 $\frac{1}{2}$	.05
Seneca Superior . . . . .	..	1.00

## TORONTO MARKETS.

June 24, 1915—(Quotations from Canada Metal Co., Toronto)—

Spelter, 28c. per lb.
Lead, 7 $\frac{1}{2}$ c. per lb.
Tin, 45c. per lb.
Antimony, 40c. per lb.
Copper casting, 22c. per lb.
Electrolytic, 22c. per lb.
Ingot brass, yellow, 13c.; red, 15c. per lb.

June 24—(Quotations from Elias Rogers Co., Toronto)—

Coal, anthracite, \$7.50 per ton.
Coal, bituminous, \$5.25 per ton.

## NEW YORK MARKETS.

June 24, 1915—Connellsville Coke (f.o.b. ovens)—

Furnace coke, prompt, \$1.50 per ton.
Foundry coke, prompt, \$2.00 to \$2.40 per ton.

June 24, 1915—Tin, straits, 41.30c.

Copper, Prime Lake, 20.00 to 20.50c.
Electrolytic copper, 19.75 to 20.00c.
Copper wire, 21.50 to 22.00c.
Lead, 5.35 to 5.45c.
Spelter, 18.00 to 18.50c.
Sheet zinc (f.o.b. smelter), 30.00c.
Aluminum, 31.00 to 33.00c.
Nickel, 50.00c.
Platinum, soft, \$40 per oz.
Bismuth, \$2.75 to \$3.00 per lb.
Quicksilver, \$95.00 per 75-lb. flask.

In the limited amount of gas which is found in the Petrolia field, Ontario, a considerable proportion of hydrogen sulphide is present; consequently, the Government gas inspector has notified the company and consumers that gas must not be used for illuminating purposes in Petrolia, unless it be first purified. In Chatham and in some other localities purification is accomplished by the companies through the use of individual purifiers in each house.

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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<b>Ontario</b> Cohen, S. W. Campbell & Deyell. Carter, W. E. H. Ferrier, W. F. Forbes, D. L. H. Gwillim, J. C. Hassan, A. A.	Haultain, H. E. T. Segsworth, Walter E. Smith, Alex H. Smith, Sydney. Maurice W. Summerhayes. Tyrrell, J. B.	<b>Quebec</b> Burchell, Geo. B. Cohen, S. W. DePencier, H. P. Hardman, J. E. Hersey, Milton L. Johnson, W. S. Smith, W. H.	<b>British Columbia</b> Brown & Butters. Fowler, S. S. <b>FOREIGN-New York</b> Canadian Mining & Exploration Co., Ltd. Colvocoresses, Geo. M. Dorr, Jno. V.N. Hassan, A. A.
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<b>C</b> OHEN, SAMUEL W., E. M. Consulting Engineer, Room 601, Dom. Express Bldg. Montrea General Manager, Crown Reserve Mining Co. Ltd. Cobalt, Can.	<b>G</b> WILLIM, J. C. Consulting Mining Engineer, KINGSTON, ONT.	<b>T</b> YRRELL, J. B. Mining Engineer, 534 Confederation Life Building, TORONTO, - - CANADA.

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FEBRUARY 15, 1927

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A catalogue of publications will be sent free to any applicant. A single copy of a map or report that is specially desired will be sent to a Canadian applicant free of cost and to others at a nominal price. The applicant should state definitely the precise area concerning which information is desired, and it is often of assistance in filling an order for a map or report if he states the use for which it is required.

Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

#### REPORTS RECENTLY ISSUED:

##### CANADA

Memoir 59. Coal Fields and Coal Resources of Canada, by D. B. Dowling.  
Summary Report of the Geological Survey for the year 1913.

##### NEW BRUNSWICK and NOVA SCOTIA

Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.  
Memoir 60. Arisaig-Antigonish District, Nova Scotia, by M. Y. Williams.  
Memoir 41. The "Fern Ledges" Carboniferous flora of St. John, New Brunswick, by Marie C. Stopes.

##### QUEBEC

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.  
Memoir 39. Kewagama Lake Map-Area, Quebec, by M. E. Wilson.

##### ONTARIO

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.  
Memoir 40. The Archaean Geology of Rainy Lake Re-studied, by Andrew C. Lawson.  
Museum Bulletin No. 8. The Huronian Formations of Timiskaming Region, Canada, by W. H. Collins.

##### NORTH-WEST PROVINCES

Memoir 53. Coal Fields of Manitoba, Saskatchewan, Alberta and Eastern British Columbia (Revised Edition) by D. B. Dowling.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.  
Memoir 66. Clay and Shale Deposits of the Western Provinces (Part 5), by J. Keele.

##### BRITISH COLUMBIA

Memoir 32. Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C., by R. G. McConnell.  
Memoir 56. Geology of Franklin Mining Camp, British Columbia, by Charles W. Drysdale.  
Museum Bulletin 11. Physiography of the Beaverdell Map Area and the Southern Part of the Interior Plateaus of British Columbia, by Leopold Reinecke.

##### YUKON AND NORTH-WEST TERRITORIES

Memoir 50. Upper White River District, Yukon, by D. D. Cairnes.  
Memoir 67. The Yukon-Alaska International Boundary, between Porcupine and Yukon Rivers, by D. D. Cairnes.

#### MAPS RECENTLY ISSUED:

##### CANADA

Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

##### NEW BRUNSWICK AND NOVA SCOTIA.

Map 27A. Bathurst and vicinity, Gloucester County, New Brunswick. Geology.  
Map 39A. Geological Map of Nova Scotia.  
Map 121A. Franey Mine and Vicinity, Victoria County, N. S.

##### QUEBEC

Map 95A. Broadback River, Mistassini Territory, Quebec. Geology.  
Map 100A. Bell River, Quebec. Geology.

##### ONTARIO

Map 124A. Wanapitei (Falconbridge, Street, Awrey, and Parts of MacLennan and Scadding Townships), Sudbury District, Ont. Geology.  
Map 49A. Orillia sheet, Simcoe and Ontario Counties, Ontario. Topography.

##### NORTH-WEST PROVINCES

Map 55A. Geological map of Alberta, Saskatchewan and Manitoba.  
Map 117A. Wood Mountain Coal Area, Saskatchewan.

##### BRITISH COLUMBIA

Map 33A. Nanaimo sheet, Vancouver Island, British Columbia. Topography.  
Map 70A. Victoria sheet, Vancouver Island. Geology.  
Map 72A. Saanich sheet, Vancouver Island. Geology.  
Map 109A. Prescott, Paxton and Lake Mines, Texada Island. Topography.

##### YUKON AND NORTH-WEST TERRITORIES

Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

**NOTE.**—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

**Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.**

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Wolframite  
Chrome Ore  
Nickel Ore  
Cobalt Ore  
Cerium, and  
all Ores  
and Minerals

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Metallurgists, Mine Owners, Merchants, Manufacturers

**THE ALBANY, LIVERPOOL, ENGLAND**

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Barytes  
Graphite  
Blende  
Corundum  
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Feldspar

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Electrolytic Copper Refinery

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Main Western Office - VICTORIA, B.C.

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NOVA SCOTIA:	-	-	-	-	-	-	Halifax
QUEBEC:	-	-	-	-	-	-	Montreal
ONTARIO:	Toronto,	Cobalt,	South Porcupine,	Port Arthur,	-	-	Kingston
MANITOBA:	-	-	-	-	-	-	Winnipeg
ALBERTA:	-	-	-	-	-	-	Edmonton
BRITISH COLUMBIA:	Vancouver,	Victoria,	Nelson,	-	-	-	Prince Rupert

## Factories at

Beloeil, P.Q.	Vaudreuil, P.Q.	Windsor Mills, P.Q.
Waverley, N.S.	James Island, B.C.	Nanaimo, B.C.
Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

# The Canadian Miner's Buying Directory.

- Air Hoists—**  
Canadian Ingersoll-Rand Co., Ltd.
- Amalgamators—**  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Assayers and Chemists—**  
Milton L. Hersey Co., Ltd.  
Campbell & Deyell, Cobalt  
Ledoux & Co., 99 John St., New York  
Thos. Heys & Son.  
C. L. Constant Co.
- Assayers' and Chemists Supplies—**  
C. L. Berger & Sons, 37 William St., Boston, Mass.  
Lymans, Ltd., Montreal, Que  
Stanley, W. F. & Co., Ltd.  
Peacock Bros.
- Ball Mills—**  
Fraser & Chalmers of Canada, Limited.  
Peacock Bros.  
Mussens, Ltd.
- Beams—Steel—**  
Dominion Bridge Co.  
Mussens, Ltd.
- Belt Tighteners and Clamps—**  
Dodge Mfg. Co., Ltd.
- Belting—Leather, Rubber and Cotton—**  
Mussens, Ltd.  
Northern Canada Supply Co.  
Jones & Glassco  
Federal Engineering Co.  
Can. H. W. Johns-Manville Co.  
Dodge Mfg. Co., Ltd.
- Blasting Batteries and Supplies—**  
Thomas & William Smith  
Can. Ingersoll-Rand Co., Ltd.  
Curtis & Harvey (Canada) Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Canadian Explosives, Limited
- Blowers—**  
Fraser & Chalmers of Canada, Limited.  
Mussens, Ltd.  
Northern Canada Supply Co.
- Boilers—**  
Mussens, Ltd.  
Fraser & Chalmers of Canada, Limited.  
Peacock Bros.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.
- Boots—**  
Dodge Mfg. Co., Ltd.
- Buckets—**  
Hendrick Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.
- Buildings—Steel Frame—**  
Dominion Bridge Co.
- Cable — Aerial and Underground—**  
Mussens, Ltd.  
Fraser & Chalmers of Canada, Ltd.  
Northern Canada Supply Co.
- Cableways—**  
Fraser & Chalmers of Canada, Limited.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.
- Cages—**  
Mussens, Ltd.  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cables—Wire—**  
Northern Electric Co., Ltd.  
Standard Underground Cable Co. of Canada, Ltd.
- Carbon (Black Diamonds and Bortz)—**  
Abe. Levine.
- Cars—**  
Jeffrey Mfg. Co.  
Mussens, Ltd.  
Northern Canada Supply Co.
- Car Pullers—**  
Dodge Mfg. Co., Ltd.
- Cement Machinery—**  
Northern Canada Supply Co.  
Peacock Bros.
- Chains—**  
Jeffrey Mfg. Co.  
Peacock Bros.  
Jones & Glassco  
Mussens, Ltd.  
Northern Canada Supply Co.  
Dodge Mfg. Co., Ltd.  
B. Greening Wire Co., Ltd.
- Chain Blocks—**  
Mussens, Ltd.
- Chemists**  
Canadian Laboratories.  
Campbell & Deyell.  
Thos Heys & Sons.  
Milton Hersey Co.  
Ledoux & Co.
- Coal—**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters—**  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.
- Coal Mining Exposives—**  
Curtis & Harvey (Can.), Ltd.  
Canadian Explosives, Limited
- Coal Mining Machinery—**  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited.  
Peacock Bros.  
Jeffrey Mfg. Co.
- Coal Punchers—**  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.
- Coal Washeries—**  
Jeffrey Mfg. Co.  
Mussens, Ltd.  
Peacock Bros.
- Collars—**  
Dodge Mfg. Co., Ltd.
- Compressors—Air—**  
Fraser & Chalmers of Canada, Limited.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.
- Concentrators and Jigs—**  
Fraser & Chalmers of Canada, Limited.  
James Ore Concentrator Co.  
Mussens, Ltd.
- Concrete Mixers—**  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.
- Condensers—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
Peacock Bros.  
Northern Canada Supply Co.
- Conveyors—Belt—**  
Mussens, Ltd.  
Boving & Co. of Canada, Ltd.
- Converters—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Peacock Bros.  
Mussens, Ltd.
- Conveyor—Trough—Belt—**  
Hendrick Mfg. Co.
- Couplings—**  
Dodge Mfg. Co., Ltd.  
Boving & Co. of Canada, Ltd.
- Cranes—**  
Smart-Turner Machine Co.  
Peacock Bros.  
Mussens, Ltd.  
M. Beatty & Sons, Ltd.  
Boving & Co. of Canada, Ltd.
- Cranes—Electric—**  
Mussens, Ltd.
- Cranes—Overhead Traveling—**  
Mussens, Ltd.  
Boving & Co. of Canada, Ltd.
- Crane Ropes—**  
Mussens, Ltd.  
Allan, Whyte & Co.  
Thos. & Wm. Smith.  
B. Greening Wire Co., Ltd.
- Crushers—**  
Fraser & Chalmers of Canada, Limited.  
Peacock Bros.  
Lymans, Ltd.  
Mussens, Ltd.  
Hadfields Steel Foundry Co.
- Cyanide Plants—**  
Fraser & Chalmers of Canada, Limited.  
Roessler & Hasslacher.  
Thos. & Wm. Smith.  
Peacock Bros.
- Derricks—**  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.  
Mussens, Ltd.
- Diamonds (for Diamond Drills)—**  
Abe. Levine.
- Diamond Drill Contractors—**  
Diamond Drill Contracting Co.  
Smith and Travers.
- Dredging Machinery—**  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.  
Boving & Co. of Canada, Ltd.
- Dredging Ropes—**  
Allan, Whyte & Co.  
Fraser & Chalmers of Canada, Limited.
- Drills, Air and Hammer—**  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Peacock Bros.  
Northern Canada Supply Co.
- Drills—Core—**  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.
- Drills—Diamond—**  
American Diamond Rock Drills.  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drill Steel Sharpeners—**  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Mussens, Ltd.
- Dump Cars**  
Sullivan Machinery Co.  
Mussens, Ltd.
- Drills—Electric—**  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.
- Dynamite—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Dynamos—**  
Northern Electric Co., Ltd.
- Electric Cranes—**  
Mussens, Ltd.
- Ejectors—**  
Mussens, Ltd.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Elevators—**  
Jeffrey Mfg. Co.  
M. Beatty & Sons.  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Mussens, Ltd.  
Peacock Bros.
- Elevator Cups—**  
Dodge Mfg. Co., Ltd.
- Engineering Instruments—**  
C. L. Berger & Sons.  
Peacock Bros.
- Engineers and Contractors—**  
Fraser & Chalmers of Canada, Limited.  
Roberts & Schaefer Co.  
Boving & Co. of Canada, Ltd.
- Engines—Automatic—**  
Smart-Turner Machine Co.  
Peacock Bros.
- Engines—Gas and Gasoline**  
Fraser & Chalmers of Canada, Limited.  
Mussens, Ltd.  
Alex. Fleck.  
Sullivan Machinery Co.  
Smart-Turner Machine Co.  
Peacock Bros.
- Engines—Haulage—**  
Mussens, Ltd.  
Fraser & Chalmers of Canada, Limited.  
Peacock Bros.  
Can. Ingersoll-Rand Co., Ltd.
- Engines—Marine—**  
Smart-Turner Machine Co.  
Peacock Bros.
- Engines—Oil—**  
Peacock Bros.  
Boving & Co. of Canada, Ltd.
- Engines—Crude Oil—**  
Boving & Co. of Canada, Ltd.
- Engines—Steam—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
Peacock Bros.  
M. Beatty & Sons.  
Mussens, Ltd.
- Fans—Ventilating—**  
Fraser & Chalmers of Canada, Limited.  
Sullivan Machinery Co.  
Peacock Bros.  
Mussens, Ltd.
- Feeders—Ore—**  
Fraser & Chalmers of Canada, Limited.  
Mussens, Ltd.
- Fixtures—Counter Shaft—**  
Dodge Mfg. Co., Ltd.
- Flights—**  
Hendrick Mfg. Co.
- Floor Stands—**  
Dodge Mfg. Co., Ltd.
- Friction Clutches—**  
Dodge Mfg. Co., Ltd.
- Forges—**  
Mussens, Ltd.  
Northern Canada Supply Co., Ltd.
- Forging—**  
M. Beatty & Sons.  
Smart-Turner Machine Co.  
Peacock Bros.  
Boving & Co. of Canada, Ltd.

Continued on page 23.

## Canadian Miner's Buying Directory.—(Continued from page 22.)

- Furnaces—Assay—**  
Lymans, Ltd.  
Mussens, Ltd.
- Furnaces—Electric—**  
Boving & Co. of Canada, Ltd.
- Fuse—**  
Peacock Bros.  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Canadian H. W. Johns-Manville Co., Ltd.
- Gears—**  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
Boving & Co. of Canada, Ltd.
- Generators—**  
Northern Electric Co., Ltd.  
Peacock Bros.
- Grease Cups—**  
Dodge Mfg. Co., Ltd.
- Hangers—Cable—**  
Northern Electric Co., Ltd.  
Standard Underground Cable Co. of Canada, Ltd.  
Dodge Mfg. Co., Ltd.
- Hand Hoists—**  
Boving & Co. of Canada, Ltd.  
Fraser & Chalmers of Canada, Limited
- Heaters—Feed Water—**  
Mussens, Ltd.  
Peacock Bros.
- High Speed Steel Twist Drills—**  
Mussens, Ltd.  
Northern Canada Supply Co.
- Hoists—Air, Electric and Steam—**  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Mussens, Ltd.  
S. Flory Mfg. Co.  
Jones & Glassco.  
M. Beatty & Sons  
Fraser & Chalmers of Canada, Limited  
Northern Canada Supply Co.
- Hoisting Engines—**  
Peacock Bros.  
Mussens, Ltd.  
Sullivan Machinery Co.  
Fraser & Chalmers of Canada, Limited  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons.
- Hoists—Gas and Gasoline—**  
Mussens, Ltd.
- Hose—**  
Canadian H. W. Johns-Manville Co., Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.
- Jacks—**  
Mussens, Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Jigs—**  
Mussens, Ltd.  
Roberts & Schaefer Co.
- Lamps—Acetylene—**  
Mussens, Ltd.  
Northern Canada Supply Co.
- Lamps—Safety—**  
Mussens, Ltd.  
Canadian Explosives.  
Peacock Bros.
- Link Belt—**  
Northern Canada Supply Co.  
Jones & Glassco.
- Locomotives—Electric—**  
Mussens, Ltd.  
Jeffrey Mfg. Co.
- Locomotives—Steam—**  
Mussens, Ltd.
- Metal Merchants—**  
Henry Bath & Son.  
Geo. G. Blackwell, Sons & Co.  
Consolidated Mining and Smelting Co. of Canada.  
Canada Metal Co.  
C. L. Constant Co.
- Monel Metal—**  
International Nickel Co.
- Motors—**  
Mussens, Ltd.  
Northern Electric Co., Ltd.  
Peacock Bros.
- Mule Stands—**  
Dodge Mfg. Co., Ltd.
- Nickel—**  
International Nickel Co.
- Ore Sacks—**  
Northern Canada Supply Co.
- Ore Testing Works**  
Ledoux & Co.  
Can. Laboratories.  
Milton Hersey Co., Ltd.  
Campbell & Deyell.
- Ores and Metals—Buyers and Sellers of—**  
C. L. Constant Co.  
Geo. G. Blackwell.  
Consolidated Mining and Smelting Co. of Canada.  
Orford Copper Co.  
Canada Metal Co.
- Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Fraser & Chalmers of Canada, Limited  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
- Pick Machines—**  
Sullivan Machinery Co.
- Picks—Steel—**  
Mussens, Ltd.  
Thos. & Wm. Smith.  
Peacock Bros.
- Pillow Blocks—**  
Dodge Mfg. Co., Ltd.
- Pipes—**  
Boving & Co. of Canada, Ltd.  
Consolidated M. & S. Co.  
Peacock Bros.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.
- Pipe Fittings—**  
Can. H. W. Johns-Manville  
Mussens, Ltd.  
Northern Canada Supply Co.
- Pneumatic Tools—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco.
- Producer—Gas—**  
Mussens, Ltd.
- Prospecting Mills and Machinery—**  
Standard Diamond Drill Co.  
Mussens, Ltd.  
Fraser & Chalmers of Canada, Limited
- Pulleys—Iron, Wood Spit, Iron Centre Wood Rim—**  
Dodge Mfg. Co., Ltd.
- Pulleys, Shafting and Hangings—**  
Fraser & Chalmers of Canada, Limited  
Northern Canada Supply Co.  
Dodge Mfg. Co., Ltd.
- Pumps—Boiler Feed—**  
Boving & Co. of Canada, Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Peacock Bros.  
Canadian Ingersoll-Rand Co. Ltd.  
Fraser & Chalmers of Canada, Limited
- Pumps—Centrifugal—**  
Boving & Co. of Canada, Ltd.  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Peacock Bros.  
Thos. & Wm. Smith.  
M. Beatty & Sons.  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited
- Pumps—Electric—**  
Boving & Co. of Canada, Ltd.  
Mussens, Ltd.  
Canadian Ingersoll Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited
- Pumps—Pneumatic—**  
Mussens, Ltd.  
Smart-Turner Machine Co.  
Can. Ingersoll-Rand Co., Ltd.
- Pumps—Steam—**  
Can. Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Thos. & Wm. Smith.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.
- Pumps—Turbine—**  
Boving & Co. of Canada, Ltd.  
Mussens, Ltd.  
Canadian Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited
- Pumps—Vacuum—**  
Smart-Turner Machine Co.
- Quarrying Machinery—**  
Mussens, Ltd.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Roasting Plants—**  
Fraser & Chalmers of Canada, Limited
- Rolls—Crushing—**  
Mussens, Ltd.  
Fraser & Chalmers of Canada, Limited
- Roofing—**  
Dominion Bridge Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. H. W. Johns-Manville
- Rope Blocks—**  
Mussens, Ltd.
- Rope Wheels—**  
Dodge Mfg. Co., Ltd.
- Rope Dressing—**  
Dodge Mfg. Co., Ltd.
- Rope—Manilla and Jute—**  
Jones & Glassco.  
Mussens, Ltd.  
Peacock Bros.  
Northern Canada Supply Co.  
Allan, Whyte & Co.  
Thos. & Wm. Smith, Ltd.
- Rope—Wire—**  
B. Greening Wire Co., Ltd.  
Allan, Whyte & Co.  
Northern Canada Supply Co.  
Thos. & Wm. Smith.  
Fraser & Chalmers of Canada, Limited  
Mussens, Ltd.
- Samplers—**  
Canadian Laboratories.  
C. L. Constant Co.  
Ledoux & Co.  
Milton Hersey Co.  
Thos. Heys & Son.
- Screens—**  
B. Greening Wire Co., Ltd.  
Mussens, Ltd.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.  
Peacock Bros.  
Fraser & Chalmers of Canada, Limited
- Screens—Cross Patent Flanged Lip—**  
Hendrick Mfg. Co.
- Separators—**  
Smart-Turner Machine Co.  
Peacock Bros.
- Shafting—**  
Dodge Mfg. Co., Ltd.
- Sheets—Genuine Manganese Bronze—**  
Hendrick Mfg. Co.
- Shovels—Steam—**  
Mussens, Ltd.  
M. Beatty & Sons.
- Slime Tables—**  
James Ore Concentrator.
- Smelting Machinery—**  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Canada, Limited
- Spiral Conveyors—**  
Dodge Mfg. Co., Ltd.
- Sprockets—**  
Dodge Mfg. Co., Ltd.
- Stacks—Smoke Stacks—**  
Canadian H. W. Johns-Manville Co., Ltd.  
Hendrick Mfg. Co.
- Stamp Mills—**  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Canada, Limited
- Steel Drills—**  
Sullivan Machinery Co.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.  
Peacock Bros.  
Swedish Steel & Imp. Co., Ltd.
- Steel—Tool—**  
Mussens, Ltd.  
Thos. & Wm. Smith.  
N. S. Steel & Coal Co.  
Swedish Steel & Imp. Co. Ltd.
- Surveying Instruments—**  
Peacock Bros.  
W. F. Stanley.  
C. L. Berger.
- Switchboards—**  
Northern Electric Co., Ltd.
- Take-ups—**  
Dodge Mfg. Co., Ltd.
- Tanks—Cyanide, Etc.—**  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Canada, Limited  
Hendrick Mfg. Co.
- Tramways—**  
Mussens, Ltd.  
B. Greening Wire Co., Ltd.
- Transformers—**  
Northern Electric Co., Ltd.  
Peacock Bros.
- Transits—**  
C. L. Berger & Sons.  
Peacock Bros.
- Transmission Rope—**  
Dodge Mfg. Co., Ltd.
- Trippers—**  
Dodge Mfg. Co., Ltd.
- Tube Mills—**  
Mussens, Ltd.  
Peacock Bros.  
Fraser & Chalmers of Canada, Limited
- Turbines—**  
Peacock Bros.  
Fraser & Chalmers of Canada, Limited
- Turbines—Water—**  
Boving & Co. of Canada, Ltd.
- Winding Engines—**  
Mussens, Ltd.  
Peacock Bros.  
Canadian Ingersoll-Rand Co., Ltd.
- Wire Cloth—**  
Mussens, Ltd.  
Northern Canada Supply Co.  
B. Greening Wire Co., Ltd.
- Wire (Bare and Insulated)—**  
Northern Electric Co., Ltd.  
Standard Underground Cable Co., of Canada, Ltd.
- Zinc Dust—**  
Roessler & Hasslacher.

## ALPHABETICAL INDEX TO ADVERTISERS

<b>A</b>		Dominion Coal Co., Ltd. .... 8	<b>L</b>	
Allan, Whyte & Co. .... 2	Dominion Diamond Drilling Co., Ltd. .... 18	Legg Bros. .... Inside Front Cover	Levine, Abr. .... 14	
American Diamond Rock Drill Co. 14	Dominion Bridge Co. .... 14	Ledoux & Co. .... 18	Lymans, Ltd. .... 9	
Astley, J. W. .... 17	Dorr, Jno. V. N. .... 17	Lindsey, G. G. S. .... 18		
	Dwight & Lloyd Sintering Co., Inc. 13			
	Dodge Mfg. Co. .... 5			
<b>B</b>		<b>E</b>		
Bath, Henry & Son .... 20	Electric Steel & Metals Co. .... 4			
Balbach Smelting & Refining Co. . 20				
Beatty, Blackstock, Fasken, Cowan & Chadwick .... 18	<b>F</b>			
Beatty, M. & Sons, Ltd. .... 9	Ferrier, W. F. .... 17			
Belleville Assay Office .... 18	Fleck, Alex. .... 6			
Berger, C. L. & Sons .... 14	Flory, S., Mfg. Co. .... 12			
Blackwell, Geo. G., Sons & Co. ... 20	Forbes, D. L. H. .... 17			
British Columbia, Province of .... 13	Fowler, S. S. .... 17			
Brown & Butters .... 17	Fraser & Chalmers of Can., Ltd... 4			
Buffalo Mines, Ltd. .... 10				
Burchell, Geo. B. .... 17	<b>G</b>			
Boving & Co. of Can. Ltd. .... 8	B. Greening Wire Co., Ltd. .... 11			
	Gwillim, J. C. .... 17			
	Guess & Haultain .... 17			
<b>C</b>		<b>H</b>		
Can. H. W. Johns-Manville Co.... 16	Hardman, Jno. E. .... 17			
Campbell & Deyell Ltd. .... 18	Hassan, A. A. .... 17			
Canadian Copper Co. .... 8	Hendrick Mfg. Co. .... 12			
Canadian Explosives Ltd. .... 21	Hersey, Milton Co., Ltd. .... 18			
Canadian Laboratories Ltd. .... 18	Heyes, Thomas & Son .... 18			
Can. Ingersoll-Rand Co., Ltd.... 1				
Can. Mining & Exploration Co. . 17	<b>I</b>			
Canada Metal Co. .... 11	Imperial Bank of Canada .... 11			
Carter & Smith .... 17	Industrial & Technical Press, Ltd. 6			
Cohen, S. W. .... 17	International Nickel Co. .... 8			
Consolidated Mining & Smelting Co. 20				
Coniagas Reduction Co. Ltd. .... 20	<b>J</b>			
Constant, C. L. & Co. .... 20	Jeffrey Mfg. Co. .... 15			
Curtis's & Harvey ....	James Ore Concentrator Co. ....			
.....Outside Back Cover	..... Outside Back Cover			
	Johnson, Matthey & Co., Ltd. .... 18			
	Jones & Glasco .... 15			
<b>D</b>		<b>M</b>		
Dept. of Mines Co. Canada .... 19	Morton, B. K. & Co. .... 13			
Deloro Mining & Reduction Co. ... 20	Michigan College of Mines .... 6			
De Pencier, H. P. .... 17				
Diamond Drill Contracting Co.... 14	<b>N</b>			
	Nova Scotia Steel & Coal Co.... 10			
	Nova Scotia, Province of .... 3			
	Northern Canada Supply Co., Ltd. 6			
	<b>O</b>			
	Orford Copper Co. .... 8			
	Ontario, Province of .... 7			
	<b>P</b>			
	Plumb Jig Companies .... 8			
	<b>Q</b>			
	Quebec, Province of .... 3			
	<b>R</b>			
	Roessler & Hasslacher Chemical Co 24			
	<b>S</b>			
	School of Mining .... 8			
	Segsworth, R. F. .... 18			
	Smart-Turner Machine Co. .... 12			
	Smith & Durkee, Diamond Drill Co. 18			
	Smith & Travers Diamond Drill Co. 18			
	Smith, Thos. & Wm., Ltd. ....			
	..... Inside Back Cover			
	Smith Sydney .... 17			
	Standard Diamond Drill Co. .... 14			
	Sullivan Machinery Co. .... 2			
	Summerhayes, Maurice W. .... 17			
	Stanley, W. F. & Co., Ltd. .... 12			
	Standard Underground Cable Co. of Canada .... 9			
	<b>T</b>			
	Tyrrell, J. B. .... 17			
	<b>U</b>			
	University of Toronto .... 9			

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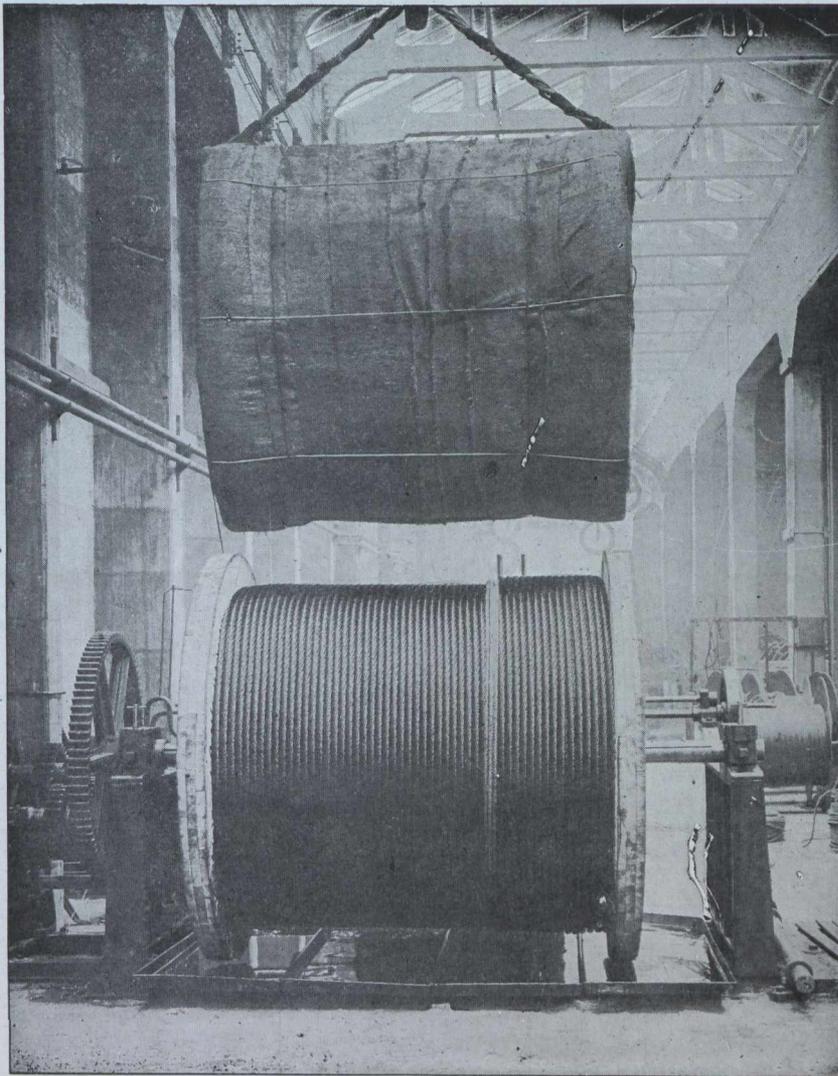
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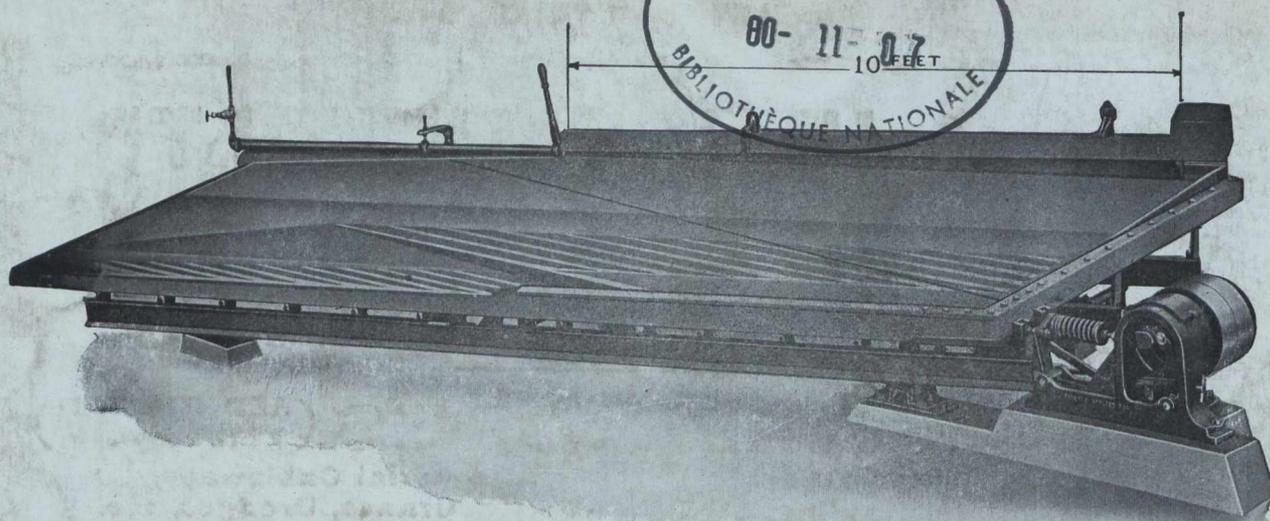
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